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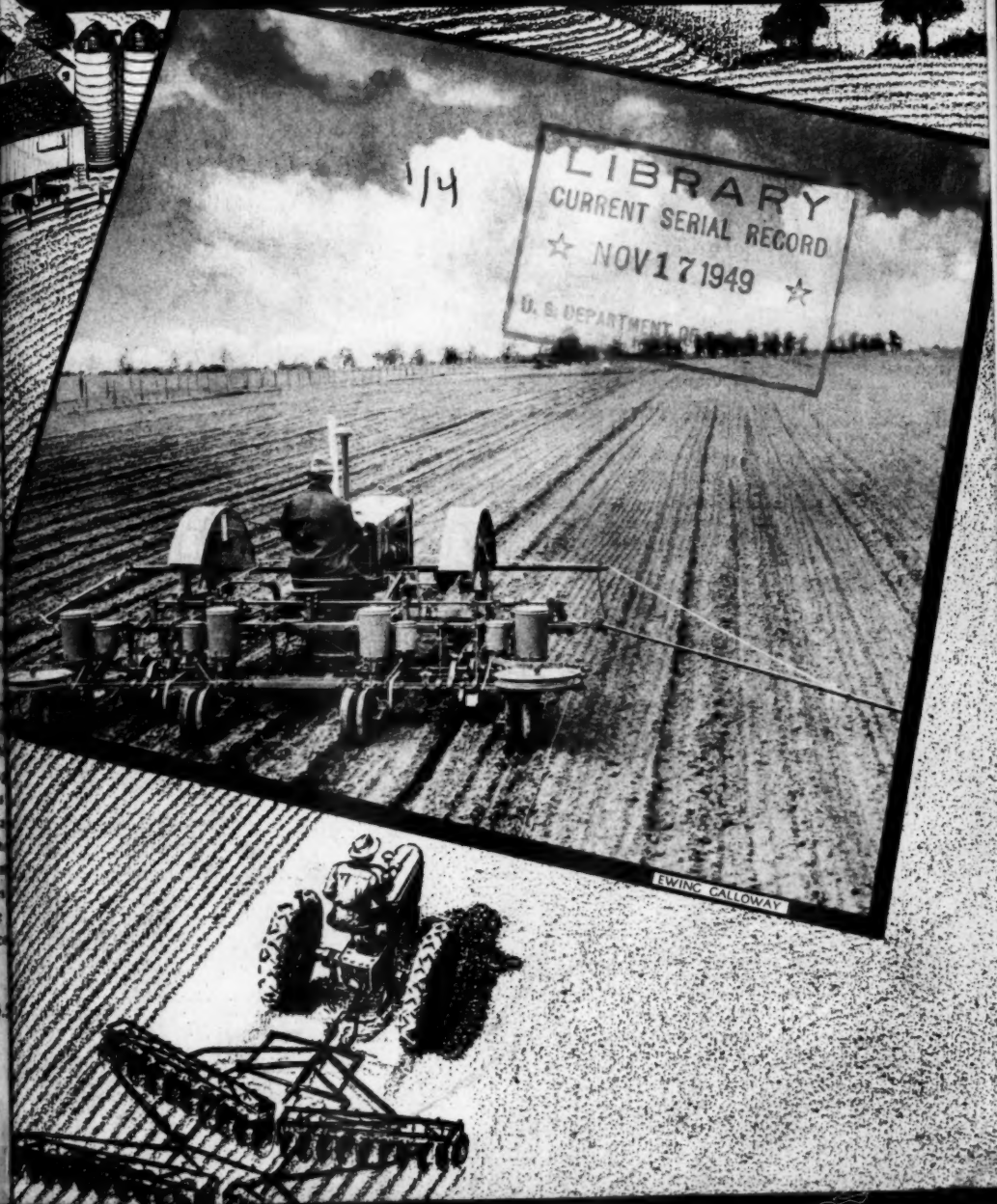

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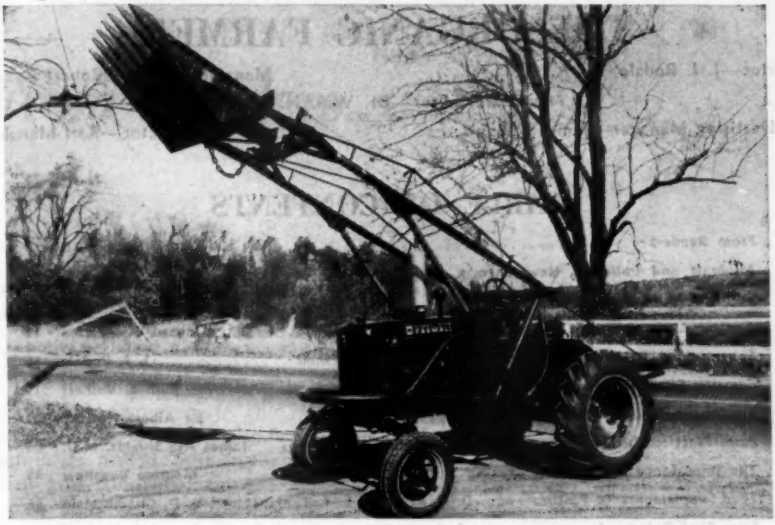

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VOL. 1, NUMBER 4 NOVEMBER, 1949

THE ORGANIC FARMER

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From Readers....

Fertilizer Dealer Abandons Chemicals

Dear Sir:

The work you are doing in trying to wake up America to the need for improved farming methods is commendable and I add my encouragement and congratulations.

Our firm has been in the feed manufacturing and grain and seed business for over thirty years, and a few years ago we added fertilizers to our line. Unfortunately it is the inorganic type. Since reading *Organic Gardening* and the various booklets relative to organic materials and compost fertilizers, we see the light and want to lend our assistence by switching from inorganic fertilizers to the organic type.

Harry Palecek,
Enid, Okla.

Aerial Dusters Kill Deer and Chickens

Dear Sir:

It is reported in our area that airplanes dusting for cotton boll weevils have killed a number of wild deer grazing in the wood lands adjacent to cotton plantations.

Our tenant farmer lost 200 fine chickens that drank water from the ground after a heavy shower. Arsenic poison washed off the cotton onto the ground.

W. R. Ellis,
Clarksdale, Miss.

Sheet Composting for An Irrigated Citrus Grove

Dear Sir:

I have 22 acres of oranges and grapefruit and am searching for ways of fertilization by the Organic Method.

Can I sheet compost? I always have a good crop of Johnson grass, weeds and yellow clover.

I have been thinking about making a compost bin, but we have no supply of water. However, when we irrigate there is a supply of water under the trees. Our rainfall is about 16 inches per year.

When would be the right time of the year for sheet composting? Our trees bloom around February. In Dr. William H. Eyster's article, "Sheet Composting on the Farm" in the April 1949 issue of *Organic Gardening*, he says, "the soil cannot make humus and grow a crop at the same time." Would this apply to citrus groves?

Robert Orlando,
McAllen, Texas.

Ed. Sheet composting would work well in your citrus grove. When your cover crop is mature, spread whatever organic matter and manure you have under the trees and disk it in. It would be best to do this just before you are ready to irrigate. Then you would not have the problem of keeping the decaying matter wet. For a permanent installation like a grove, it is all right to allow organic matter to decay while a crop is growing.

Mulches would also be practical for your grove, if you have enough material. Another fertilization practice applicable to orchards is the ring method of compost making. The compost ingredients are built up in rings around the trees to a height of about two feet. You then have actual compost heaps under each tree. Organic matter would retain its moisture better if more of it is kept in one spot, as in the ring method.

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The Organic Method for Citrus

Dear Sir:

I would like to know if the Organic Method can be used in Florida for the raising of oranges and grapefruit, and if the methods are so treated in any of your literature.

Carlton B. Waller,
Stamford, Connecticut.

Ed. The Organic Method can definitely be used in the production of Florida citrus, as evidenced by the many citrus growers in Florida who are selling organically produced fruit. The article by John Volkert on Growing Florida citrus by the Organic Method in this issue gives definite hints and instructions.

More Trouble With Artificial Insemination

Dear Sir:

I have received the first number of The Organic Farmer which I find very interesting. The publication of a journal devoted to the interests of the self-sustaining farmer himself, more than to the interests of those who would sell something to him, has really long been overdue.

About the artificial insemination of dairy cattle—it's not the cows that these establishments are having trouble with—but the bulls. The bulls sometimes turn very ugly and vicious and "refuse to work," sometimes becoming worthless for natural breeding methods thereafter. There has been quite a lot about this in some of the farm and dairy papers. Also, the modern dairy cow does not have to carry an over weight udder around entirely unaided, for she may be fitted out with an "udder supporter," some-

times called a "bassy-bray." It is a suspensory-like affair. There seems to be no end to the making of gadgets to sell to the farmer.

Archer P. Wallen,
Stockbridge, Michigan

Ed. A fellow came into the office the other day claiming that in his area many cows were having complete udder ruptures. The udder gets so heavy that the muscles supporting it break down and it sags to the ground.

A Dutchman's Impression Of American Agriculture

Dear Sir:

I emigrated from Holland to this country in May 1947. I was surprised to find such poor soil in America. The farm I work on here on the Cape was not much more than sand and stone. Last summer the seeds I put in never grew higher than 2 inches. Since I have put the Organic Method to work I have been getting somewhere. Still, it is not as good as my soil at home, but I feel that it is the only correct way.

In Holland we put on heavy applications of manure, and some of these gardens have been worked for centuries and are still fertile.

I make fertile pots out of my compost to grow my plants in before I plant them in the garden. This works amazingly well. With a simple tool I make up to 40 pots per minute.

Hans Nichelass,
Buzzards Bay, Mass.

The Story of An Organic Orchard

I am an ardent subscriber to *Organic Gardening* magazine and an ardent believer in your methods. Two and a half years ago I bought a five acre place at the edge of town. Shortly after we moved I was paid a visit by a former owner. He asked me if I had ever heard of *Organic Gardening*. I replied in the negative. Thereupon he gave me a friendly talk on the subject and proceeded to explain that he had planted the two hundred tree orchard to grow organically. He

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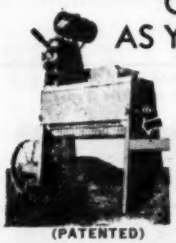

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also gave me a pamphlet on Organic Gardening. The bug bit me and slowly I have become more and more on your side of the fence. No chemical fertilizer, spray gun or heavy machine has been on my place.

This summer I spread the mowings of the orchard around the trees and the limbs gradually took on new growth. Another orchard nearby that fertilizes with chemicals is having trouble with burned out trees and the owner wants to sell out.

The trees are five years old and several of them had apples this year. The ground has not been built up much yet. The peach trees did pretty well this year, too. When we moved in the knee high young trees the roots were bare to the hot rays of the sun with no mulch at all. Some of them died and others contracted the sickliest looking bark you ever saw. Since I have mulched them with what organic matter I could lay my hands on, the bark of nearly all those trees has cleared up and has the bright shiny look that just begs you to run your hand over it like you would a pet collie dog. The neighbors have been commenting on my heavy bearing apple trees in the yard. They said that those trees never bore fruit in the years before we came. The mulches looked pretty messy looking at first, but even the corn stalks disappeared by spring. I guess the worms hauled them down to the tree roots.

I have been doing a lot of mulching now because I have not had time to make much compost as yet. The small heap I made last year went to new plantings and into the garden. But I have one to be turned now and another in construction. I planted fourteen musk melon hills in compost and got bushels of sweet melons. Even this year we had enough compost around and enough birds that we were not bothered with any bugs. I had a hundred pounds of potato seed planted and we never sprayed or dusted and we never found one bug.

Robert L. Sutton,
Findlay, Ohio

Minerals And Polio

A New Theory

Reprinted from *The Houston Post*

A HOUSTON doctor thinks he knows how to prevent poliomyelitis. He bases his unusual theory to a large extent on the similarity of the loin disease in cattle to polio in man.

Dr. William M. Brumby says both diseases are caused by a deficiency of calcium and phosphorus.

He also points to a map of Texas showing the prevalence of calcium and phosphorus in the soil. Those areas with high percentages of calcium and phosphorus have little polio.

Brazoria County, with a high percentage of calcium and phosphorus, has had little or no poliomyelitis.

Harris and Tom Green Counties have been hard hit by polio; both counties are deficient in calcium and phosphorus.

He says loin disease is very similar to polio. Feeding cattle with bone meal to make up the deficiency has just about whipped the cattle scourge.

He thinks the same principle would work with humans.

Doctor Brumby says polio affects the spine and the nervous system. He also says it is an accepted fact that phosphorus builds up nerve tissue, and calcium is necessary for proper bone health.

He has a differential diagnosis chart showing similarities in loin disease in cattle and polio in man.

1. Both are prevalent in areas with a deficiency of calcium and phosphorus.

2. Both occur mostly in the summer.

3. A pregnant woman is more frequently affected by polio than the general run of the population. This is due to a drain of calcium in her system by the foetus she carries. A new-born child normally has a high degree of calcium phosphate in its system; the mother has a low degree.

Usually a cow with a suckling calf is most susceptible. The cow is deficient in calcium and the grass on the range, particularly in certain areas, does not provide sufficent calcium and phosphorus. The calf usually is immune.

4. The incubation period varies from two to seven days for man and three to seven days for cattle.

5. Signs for man: Stiffness in the neck, thoracic or lumbar region for two or three days; inability to sit up without the hands being placed on the bed behind him for support. Temperature seldom is as high as it is in acute systemic diseases. Extensor muscles usually paralyzed.

For cattle: Tail hangs limp; during third or fifth day the cow begins to stagger or limp on one hind leg. There is a tendency to drop that foot or elevate it with a jerk in walking. Next, she is found lying down, paralyzed in her hind legs and unable to place her hind legs forward. Extensor muscles paralyzed.

6. Both the infant and the calf show signs of immunity due to a high phospho-calcium blood content at the expense of the mother and the cow.

Ranchers have defeated loin disease by feeding cattle bonemeal which has a high content of phosporus and calcium.

Doctor Brumby thinks the same immunity could be developed for man by supplying a sufficient amount of phosphorus and calcium in the diet.

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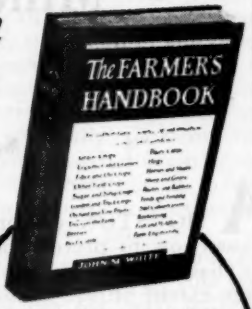

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Editorial

THE NEW ORGANIC METHOD

"IS IT necessary to make compost on my hundred acre farm," writes a reader? "I do not have a source of manure," he continues. It is not necessary to have manure to farm by the organic method. Neither is it necessary to make compost. Here briefly is the method: Wherever possible, grow leguminous green manure crops for plowing or discing under. Rotate your crops properly, not making the rotation too short. Use the ground rock fertilizer like rock phosphate and potash or granite rocks which are not too soluble, and which do not *force* their nutrients on the plant. Also use ground limestone (preferably dolomite) which is rich in magnesium.

If one can see one's way clear, it will pay to fallow a part of the farm each year. In the end, the average yields will be increased. One cutting a year from such a fallow could be used as an organic amendment to some other field in preparation for a growing crop. The other cuttings are to lie as a mulch in the fallowed field. I know of a farmer who rests 1/3 of his farm each year growing soybeans and sweet clover as green-manure crops which he discs under He is enthusiastic about its general tonic effect upon his farm. It has raised the level of his yields.

The question of fallowing will assume more importance as time goes on because of the tendency toward reduced public consumption which usually occurs as the prosperity levels recede, and which may depress prices for farm crops. Will it not then be economically advisable to regulate or reduce the number of productive acres so that the supply of food will not exceed the demand by too much? It might be good business sense to do so and at the same time build up the general level of farm fertility of the country's land. Such regulation would be far better than to exhaust soil by growing crops, upon which the Government will pay a subsidy and then destroy such crops as was done recently when potatoes were piled in public dumps and kerosene was applied so that they would not find their way into people's stomachs.

For the application of the organic method, green manuring and the use of potash, phosphate and lime rock material will give comparative results with the chemical method, but for superior results, for the raising of the health level of plant, animal and man, another factor must enter into the equation. Additional green matter and residue materials should be secured. This can be done in two ways, or in a combination of the two ways.

Organic matter, such as castor pomace, cotton seed meal, vegetable garbage tankage, etc. can be purchased. Check with your county agent for sources. The second and cheapest method is to find free organic materials such as leaves, weeds, apple pomace and wood shavings. If you put your mind to it, you will be surprised at what you can get for nothing. We will have articles from time to time in this magazine, making surveys of

such material which is available. On our farm we get tons and tons of corn cobs from a mill free of charge. Before we came along they incurred expense each day by burning it up. There is spoiled hay, roadside and grass trimmings, the family garbage, weeds from neighboring unfarmed fields, etc.

How and when shall this green matter be applied? That has to be studied out in each situation. In a field where we are going to plant corn next spring, we are now (about October 5th) preparing it by plowing. We are then going to apply the green matter and disc it in. We hope to apply sufficient matter so that erosion of a plowed field will not be a factor. We have large amounts of smashed up corn cobs and some spoiled hay. We are also taking a cutting of weeds from an 18 acre field nearby which is not being farmed. We do not have manure available at the moment, but we will apply potash, phosphate and lime in the form of the safe rock materials, not in the chemical fertilizer form. We expect a great multiplication of earthworms in this green matter litter. Their manure will be the animal matter required as a fertilizer.

This system of applying green matter may in some cases do away with the need for planting green manure crops. Take the case of a wheat crop. When the wheat is harvested in early July, the field can be begun to be treated with green matter for a crop of potatoes next spring. There is a period of almost ten months in which a heavy dressing of corn cobs could decay before the next crop comes in. There are other factors which have to be studied. The green manure crop may have the effect of keeping down weeds in the growing wheat and may have a value from that point of view. The whole subject is in swaddling clothes. Our readers will be our laboratory. You will apply the method, in many cases on an experimental basis in limited amounts of land. We hope you will write us of your experiences so that we may pass them on to other readers.

There will be a special problem in dry land country where irrigation is practiced. Here, if green matter is to be put in fields it may have to be ground up fine and perhaps a method will have to be found to run irrigation water on it. A visitor to this office from a dry section in Texas told us that they made a compost pit right in the way of an irrigation chanel. The water runs right through the pit and brings organic matter to the land. After a few months this farmer told us that he saw earthworms on his farm for the first time. Perhaps finely ground green matter could be placed in such a pit and the irrigation water bring it to the fields. Sawdust and finely ground leaves may be effective for such a pit.

In the north under winter conditions, where there is manure and it is not practical to haul it to the fields, it should be stored under cover so liquid essences are not leached downward. A supply of top-soil should be on hand to apply in layers with the manure. For every six inches of manure, apply about ¼ inch of top soil. In the regular season the manure should be brought out into some field as accumulated.

In the orchard, I like what is called the *RING METHOD.* Under each tree, starting about a foot away from the trunk and going a foot or two beyond the drip-line of the branches, are piled the ingredients that would ordinarily go into a compost heap, a mixture of manure, green-matter, phosphate, potash, lime rock materials, etc. It will gradually decay and act as a mulch at the same time, preventing weeds from growing, conserving moisture, etc. A mulch should also be applied between the trees in the entire orchard.

Watch the columns of this magazine for advertisers of grinding machines. In some cases, especially where green-matter is applied only a few months before the crop is to go in, the material will decay better if it is ground up.

An ensilage cutter, of the four-knife type, will do a good job of grinding. A hammer mill is somewhat slower but may be satisfactory.

In many cases farmers will want to make compost. In such cases we advise that it be made on a cement base, and in rainy weather be covered so that too much water does not waterlog the mixture. Such composting will be for special uses only.

As I said before, time will bring about new problems. It may take a few years, but from the work of our readers and ourselves there will evolve a new practical, organic method, that should eventually replace the present agricultural concepts which accent wrongly on the concentrated, soluble chemicals and poison sprays.

—J. I. RODALE

Dolomite

Dolomite limestone or dolomite is the kind sold usually as agricultural lime. Very often there is no indication on the bag that the lime is dolomitic, but every lime product sold on a large scale contains calcium and magnesium. The Magnesium carbonate varies from 1 to 44 per cent, while the calcium carbonate goes from 97 to 54 per cent. The magnesium becomes slowly available in the grounds, and though not all plants need great amounts of magnesium, they all pick it up.

It has been found that a soil rich in magnesium produces plants that pick up less potash, while, in a magnesium-depleted soil, they substitute potash for the missing magnesium. A group of French investigators attributed to the oversupply of potash certain nutritional troubles, and they propounded and supported the hypothesis that soils rich in potash, but poor in magnesium, produce a higher cancer rate among humans.

The more magnesium there is in a lime stone, the finer it must be ground to produce quick effects on growing plants and humans. As in the case of lime, certain soils are not in need of calcium, but may be short of magnesium. In those regions, dolomite is not indicated but local products are available. Talc is frequently used as a carrier of magnesium, but other rock products are undoubtedly equally suited. Once magnesium and calcium have entered the plant and are in organic form, they break down again into plant food. Plant matter derived from soils which have been limed consequently has a higher fertilizer value for calcium-loving plants than plants from sour soil. But to produce quick action, a sprinkling of dolomitic lime into the compost or directly on the ground is the natural method.

For all practical purposes, it must be remembered that soils that are heavily limed should also be supplied with phosphate rock, since there might be otherwise a shortage of phosphorus for maturing plants. How much to apply had best be discussed with the county agent or the Experiment Station of the State.

ANOTHER LOOK AT TRACE EL

By Leonard Wickenden

Author of Make Friends With Your Land

Part One — The Mail Came

Organic Gardening, in its December 1948 issue, published a chapter from my book, *Make Friends With Your Land,* on the subject of Minerals and Trace Elements. Nothing I have ever written has brought me such voluminous correspondence. As usual, those who disagreed with me outdid, both in the length of their letters and their ferocity, those who were on my side. There was something about the chapter which made the chemiculturists boil over.

Even those correspondents who did their best to observe the basic courtesies of civilization showed a tendency to jam down the shift lock of their typewriters and burst into capital letters for two or three lines in each paragraph, feeling, no doubt, that only by screaming their wisdom at the top of their lungs could they hope to penetrate to the embryonic brain of such a numbskull as myself. Others threw civilization to the winds. They told me in unpolished terms that my wicked doctrines would bring sickness and death to untold thousands and sought to convince me that I was a conscienceless thug of incredibly low mentality, whose skill in writing was even more obviously lacking than my knowledge of agriculture.

Some of these letters enclosed bulletins, pamphlets, booklets, or reprints from technical journals, so that I now have quite a library of them on the shelf above my desk. During the last few months, whenever I could spare time from nursing my garden through the scorching drought, I have had a wonderful time studying these publications. They were, of course, supposed to convert me—to save my soul from the fires of organiculture. To make my salvation surer and easier, the senders had underlined certain passages with pencils of varying hue, and in some cases had drawn a large arrow, pointing to some statement, with the command: "Read this! ! !" I felt grateful to the senders for not adding the words: "If you can."

Well, I read this and I read that. I read every marked passage; but I also read the passages that had *not* been marked, and they were what gave me such a wonderful time. For I made this strange discovery: it is only necessary to give the trace element enthusiast free rein, plenty of paper and some kind of an instrument with which he can cover it with words, and an unkind fate will lead to his own destruction. He will proceed, first, to maintain that soluble chemi-

ELEMENTS

cals containing trace elements must be added to the soil, and then that such procedure is not only unnecessary but fraught with danger. The strange thing is that he doesn't know he is doing it. It is as if some mischievous sprite, or his guardian angel, or some other creature from the spirit world were guiding his hand and making him put down words that are his own undoing.

These weeks of reading and pondering have led me to three conclusions:

(1) Alleged deficiencies of trace elements have been reported only since manures and composts began to be abandoned in favor of commercial fertilizers.

(2) While there is much difference of opinion as to the benefits to be derived from adding to the soil soluble chemicals containing trace elements, there is general agreement, among chemiculturists and organiculturists alike, (a) that they are toxic when added in excess, (b) that the margin between the amount that is beneficial and the amount that is disastrous is extremely narrow.

(3) There is no *conclusive* proof that so-called trace elements, such as boron, copper, zinc, manganese, cobalt, iodine and so forth, are essential to the growth and well-being of plants. (Before a new barrage of verbal bombs filled with capital letters descends upon me, let me beg my indignant critics to wait until I have dealt with this point, in detail, later.)

Let us take these conclusions one by one and examine the evidence.

That deficiencies in trace elements did not occur until the advent of chemical fertilizers is held to be true, not only by organiculturists, but by chemiculturists also. The belief appears to be accepted so widely as to be beyond argument, as will be apparent from the following quotations which are all taken from articles or other publications arguing in favor of supplying trace elements in the form of soluble chemicals containing them.

The first is from the Yearbook of Agriculture, 1943-47, U. S. Department of Agriculture. Dr. Matthew Drosdoff, in a chapter entitled: *The Use of Minor Elements*, p. 578, writes: "The trend away from organic fertilizers and manures and toward the use of more concentrated materials has accentuated the need for supplemental elements. Manure and compost usually contain a balanced amount of minor elements and farmers who still use large amounts of these materials are less likely to encounter deficiencies of minor elements," which is Dr. Drosdoff's cautious way of saying they won't encounter them at all.

Next we turn to one of the pamphlets sent me by a correspondent. It is written by Dr. L. O. Gratz, Assistant Director of Research at the Florida Agricultural Experiment Station. Dr. Gratz is writing about the soil of Florida and the wonderful results obtained by adding copper, zinc, iron, manganese, boron, magnesium and cobalt. I quote:

"For several years before 1935, increasingly large applications of nitrogen, phosphorus and potash on Florida's citrus groves seemed to result only in a decline of the trees, a decrease in yields and a lowering of fruit quality. Decades previous, citrus groves *remained thrifty on more fertile but colder soils fertilized with barnyard manures* and less refined commercial fertilizers. Through the use of rough lemon, rather than sweet or sour orange root stocks, it was possible to plant in warmer but sandier locations. This resulted in greatly increased acreage, *in the use of large quantities of mineral fertilizers, and in a decline in yield after 5 or 6 years of satisfactory production.*" (Italics mine.)

You will note that everything was all right as long as barnyard manures were used, but that when large quantities of mineral fertilizers were used things began to go wrong. It was then that trace elements had to be added to check the decline in production.

Another pamphlet generously supplied by my critics was written by J. F. Wischhusen of the Manganese Research and Development Foundation. He is writing about essential elements in tree nutrition, but give him his head and see what happens. He writes:

"Satisfying the mineral requirements of trees by the direct application of fertilizers is not, in itself, sufficient treatment to ensure continued growth; biological factors also play an essential role in promoting soil fertility.... The factor inhibiting the activity of fungi can be removed by the application of comparatively small amounts of organic composts which produce dramatic and lasting effects."

Another is by Dr. A. A. Nikitin of the Tennessee Copper Company who comes out bluntly and says:

"It is the opinion of Florida soil experts that the change from organic to inorganic fertilizers is a big factor in increasing soil deficiency in Florida."

Finally, here are the opening words of an article published in New England Homestead for June 11, 1949, written by Walter S. Eisenmenger and entitled: *Importance of Magnesium in Plant Growth*:

"Magnesium has recently taken in a new importance as a necessary element for plant growth. Its relative scarcity has been observd in areas where commercial fertilizers, instead of farm manures, are used in part or wholly. In the countries of old civilizations its scarcity does not come to our notice, for these people use manures from animals."

Let us thank these five gentlemen for showing us so convincingly that our fathers never worried about trace elements because there was no need to worry until commercial fertilizers began to replace manures and composts. I feel that I could add nothing that would make the case for organiculture any stronger, so I will proceed to the next point.

This is the first of a series of five articles.

PINE NEEDLES

Like other leaves, pine needles are worthwhile for fertilizing purposes, but, different from broad leaves, they break down slowly, largely because resins and turpentines counteract attacks by bacteria as well as by water. Small quantities can be mixed in with fertilizers of other kinds, especially as part of the plant matter of the compost heap; larger quantities may be used for mulching trees; but considerable quantities had best be exposed in a separate pile to the influence of the weather so that they may gradually break up.

The mineral composition of pine needles is so varied according to species and soil that no average analysis can be given, but it is important to note that the nitrogen content is about half of one per cent. The resins in the needles are not always satisfactory from the gardener's point of view, because they may inhibit the growth of certain plants, while the oils and terpenes contained in pine needles may exert an unfavorable effect on the bacterial flora in the ground. Excessive use of pine needles is therefore not advised. The fact that these materials do not easily compost shows in itself that pine needles are antagonistic to bacterial action.

Enzactivator

A New Development In the Organic Method

By J. I. RODALE

ABOUT six months ago I had business that took me to Washington, D. C. As I had three or four hours left of the afternoon after the conclusion of my transaction, I bethought myself of the U. S. Patent Office and what a wealth of information reposed in its tremendous archives. I had often thought that in the field of fertilizing and compost-making there must be many patents, new and old, which would be interesting to look over. Perhaps, even if only one little crumb of valuable information came out of it, the time spent would be well worth while.

I found many patents that were interesting, but one of them, was the "crumb" I was seeking, and in my opinion it is so important that it has terrific possibilities. Up to now, in the consideration of the organic method we have been talking about such things as organic matter, humus, bacteria, nutrients such as phosphate and potash, etc., but rarely has the word *enzymes* been used or spoken about. The patent that I found, and which expired in 1948, deals with a method of making enzymes. It can now be utilized by anyone without paying a royalty, for a patent has a protection period of only 17 years.

This patent was taken out in the U. S. Patent Office on February 10, 1931 by Kazuyoshi Yamaji of Tokyo, Japan. It is Patent Number 1,791,918. The patentor says that it is a "Powdered deodorizer for the acceleration of ripening of organic fertilizers."

Enzymes, substances made up of protein, are found in plants and animals and are capable of producing chemical changes in other substances, by catalytic action, that is without itself being changed or consumed. Eventually, through wear and tear, the enzyme disintegrates and must be replaced. In other words, an enzyme does not last forever. Enzymes make possible digestion of foods, respiration, and the functioning of body tissues and organs. All living processes in plants and animals are influenced by enzymes. A popular example of an enzyme is pepsin in the stomach which aids in the process of digestion. The saliva consists mainly of a dilute solution of an enzyme called salivary amylase, which converts starch to sugar. The making of alcohol and carbon dioxide from sugar and yeast is accomplished by the action of enzymes.

An enzyme is not a bacterium. It is created by the living cell of a plant or an animal, including bacteria. In the cell, of which there are billions in a plant, there is a little world which operates a vast multitude of activities. This tiny cell builds enzymes from substances it draws from the blood or from the nutrients drawn in by the roots of a plant. In a plant, there-

fore, the enzymes are made by substances obtained directly from the soil, which shows how important it is to grow a plant in a healthy soil, and not in one saturated with poison sprays and concentrated, too soluble, chemical fertilizers. Once they are produced, the enzymes are almost indestructible, and even life itself is not necessary for their actions.

In the break-down processes of organic matter not only bacteria and fungi take part, but also enzymes. We know that the latter play a prominent role in the decomposition of carbon compounds which are the most prevalent constituent of organic matter. The finding of this patent, giving a method of making enzymes, may be the beginning of a series of researches, which will improve the organic method and make it even more scientific than the chemical fertilizer method of today.

In going back to this patent, Yamaji says:

"The object thereof is to mix it with such organic fertilizers as the excrement of live stock, fish or animal manure, etc. so as not only to accelerate their ripening, but to prevent the growth of harmful bacteria and the escapement of the ammonia which is the last product of the decomposition, and at the same time to stop the disagreeable odor produced from these kinds of manures.

"The matters discharged by animals more or less vary according to animals and the food taken by them, but consist principally of protein, for example, albumin, globulin, nuclein, peptone, mucin and their decomposition products and next of carbohydrate, for instance starch, cellulose, sugars and organic acids. These matters, when decomposed, usually produce substances of disagreeable odor such as indol, skatol and other sulphides. The known deodorizer does not remove these substances of disagreeable smell, but simply offsets the disagreeable odor temporarily by its own good smell and does not prevent the production of these substances. Also, when various kinds of excrement are used as fertilizers, they must be ripened, and no deodorizer has ever been known to accelerate the ripening of fertilizers and at the same time to stop the offensive odor caused by their decomposition.

"However, the deodorizer produced by the present invention ripens rapidly such organic fertilizers as animal excrement, fish manure, night-soil, etc. when it is mixed with them. Moreover, it prevents not only the growth of harmful bacteria, but also the escape of ammonia, the last product of the decomposition, and at the same time stops the disagreeable odor caused by the decomposition of the fertilizers. The essential feature of this invention consists in mixing dried and powdered cereal containing a large quantity of enzyme with rice-bran, barley-bran or wheat-bran and adding a small quantity of water thereto, after which it is heaped for fermentation and then is dried and powdered and finally is mixed with tricalcium phosphate and powder of germinated seeds of cereal such as barley, wheat, bean, etc. which contain a large quantity of enzyme. If this deodorizer is sprinkled in water closets or on other filthy matters or various kinds of organic fertilizers, it will saccharify the starch by the powerful enzyme contained therein and supply sufficient nutrition to yeasts and bacteria so as to make their breeding vigorous and thus drive out the other harmful bacteria.

"On the other hand, it accelerates the decomposition of albumen and converts it into an intermediate product free from unpleasant smell. Also, it fixes the ammonia produced by the organic acid and the superphosphate produced by enzyme and prevents its escape and thoroughly suppresses its bad smell.

"The followjng is an example of carrying this invention into practice:

"Mix well about 3.75 kilograms of dried and powdered cereals containing a large quantity, preferably of hydrolytic and proteolitic enzyme, for instance, barley, wheat or bean with about 37.5 kilograms of rice-bran,

barley-bran or wheat-bran and add thereto about 24 litres of water. Then, heap the mixture for fermentation, after which it is dried and powdered and finally is mixed with about 3.75 kilograms of dried and powdered germinated cereal containing a large quantity of enzyme, for example, farley, wheat or bean and about 3.75 kilograms of tricalcium phosphate. The above mixture, when added to organic fertilizer, accelerates its ripening, and, when sprinkled in places which usually emit unpleasant odors, such for instance as water closets, eliminates such odors."

Instead of tricalcium phosphate I would use phosphate rock. It is much cheaper and contains over twenty rare mineral trace-elements as well as the calcium and the phosphate of the tricalcium phosphate. Here are the instructions I issued to our gardener who since has made 3 batches of this material, in ever increasing quantities.

Japanese Enzyme Activator

1. Mix 4⅛ lbs. of dried and powdered wheat with 4⅛ lbs. of dried and powdered barley, from our own stock.

2. Mix a total of 82½ lbs. of bran of wheat, barley, rice or bean (purchased). If all cannot be obtained, confine to 3 or 2 or 1, but there should be a total of 82½ lbs.

Then mix batches 1 and 2 together thoroughly and add 25-1/3 quarts of water (rain water is preferred).

Then heap the mixture for fermentation, after which it is dried and powdered and finally is mixed with about 8¼ lbs. of dried and powdered germinated cereal (½ wheat—½ barley) of our own, and 8¼ lbs. of phosphate rock.

As soon as the first batch of this enzyme activator was ready we tested it. It so happened that we were about to grow beans under ten different conditions for another purpose and decided to treat two of the pots with the enzyme activator. Unfortunately, in this test there was not one pot with compost as a comparison. Therefore we do not have such a comparison. The yield with this activator was excellent, but two other important facts were noted. The color of the leaves was the best in these two. Also the plants stood up ruggedly on their own legs. This is an important point which might indicate that the plant is securing sufficient potash, because it is potash that aids a plant to have rigidity. This winter, in our hothouse, a more scientific test will be made with this enzyme activator in growing plants.

A few words about how to go about making some of this enzyme activator, which might be given the special name of enzactivator. We are making ours using wheat and barley seed. Such grain can be purchased from feed dealers. Look at your newspaper for daily quotations of these grains, as a guide to the selling price. A farmer may use his own crops, but if he wishes to make it in larger amounts he may find it to his advantage to buy the grains. The question as to whether a farmer will find it economically feasible to apply such a fertilizer depends on many factors and will have to be studied out and tested.

However this enzactivator may have special applications on the farm. For example, it could be mixed with the chicken mash and with animal feeds. I believe it would be a healthy addition to their diet, but in such case I would leave out the phosphate rock on account of its high fluorine content. It could be an excellent treatment under fruit trees in an orchard. It is especially recommended in the gutters of cow-barns to reduce odors, tie in the nitrogen and start the process of ripening of the manure. As far as cost is concerned, the materials would come to about fifty dollars a ton. 250 pounds to the acre might do wonders. It is in powdered form and could be applied to the land in a grain drill. For oats that have a tendency to lodge it may be perfect, because our experiment showed that the enzactivator made it stand up.

In the garden it may be a boon if used as a fertilizer along with organic

matter. It could be mixed with dressings of such material that is dug into the soil at the end of the season and will aid its decay, as well as furnish valuable additional nutrients. The beauty of it is that a batch of enzactivator can be made in about three weeks, and used immediately with a planting. To me, this is the most exciting development that could have been added to the organic method, because it furnishes what I believe to be a wonderful fertilizer, full of enzymes, which will give us even higher quality in growing plants than we have been getting.

How To Make It

First you must find a method of grinding the wheat and barley coarsely. A machine has been advertised in Organic Gardening for grinding grains. Sears Roebuck and Montgomery Ward also have such machines. After it is ground and mixed with the bran (one kind of bran will do) and the water applied, put it in a heap on a floor to ferment. If it gets dry add a little water from time to time. After two or three weeks it is ready to be mixed with the powdered sprouted grain.

In sprouting the grain, it can be placed on shallow pans with holes for the water to drip out . The grain is placed in these pans about one half inch to one inch thick and in a few weeks will sprout. The sprouts do not have to be more than about a half inch to an inch. Keep watering. We will soon run a series of articles on different methods of sprouting grains.

Seeds As Fertilizer

For the gardener it may also be practical to use ground up seeds as a fertilizer. Seeds such as beans, soybeans, wheat, barley, oats, sunflower seeds, etc. ground up and put into the soil about two weeks before planting the crop will furnish excellent fertilizer value, including vitamins, minerals and enzymes. This is a method of insuring that rare trace elements get into the soil, because seeds usually contain them. A hundred pound sack of wheat costs but three dollars or so. It is cheaper if you buy it from a farmer. Eventually certain mixtures of seeds can be figured out, including legumes such as soybeans, to give a balanced nitrogen, phosphorus and potash content.

Japanese Method With Night Soil

In the orient where a great deal of human excrement is used as a fertilizer they have found that to hasten the breakdown of the material, a few handfuls of powdered soybean is quite effective. Enzymes in the soybean speed up the breakdown of organic solids. By doing this the period of putrefaction is reduced to one or two weeks.

New Dairy Disease

A new ailment which affects only cows of high producing herds has recently been discovered. Dr. Leslie M. Hurt, head of the Los Angeles County Livestock department, told members of the Santa Barbara Farm Bureau of the disease in a recent address.

The disease, known as "acetonemia," is believed to be the direct result of heavy protein feeding in an effort to push cows beyond their normal capacity to produce milk. The symptoms of the disease are similar to those of "milk fever" and it is treated by the supplemental feeding of trace elements, vitamins and a lowered protein ratio.

An uncultivated citrus grove.

GROWING CITRUS ORGANICALLY

By John E. Volkert

An Uncultivated Grove Thrives In Florida

IT WAS the severe Florida freeze in mid-winter of 1934 that turned my attention toward operating a small, economical grove. My season's crop of citrus was frozen, most of a prospective truck crop was destroyed and the poultry flock hadn't paid off during the depression of 1933.

In discussing the matter with my fertilizer supplier, I learned things about caring for a grove that were new and startling to me. He spoke of a planting then known as the Mammoth Grove, owned by a group of bankers whose *modus operandi* was to only mow their grove, hoe under the trees and fertilize. They didn't get as large crops as some folks who continuously cultivated, but their grove was consistently profitable.

Next, I listened to a state agriculturist who was holding meetings all over the state to discuss the fertilizer requirements of citrus. In one of his

sessions he brought out the fact that in another part of the state a grove operator was deliberately planting grass in his orchard while everyone else was keeping the disk harrows on the go to keep down the cover crop. They only let the grass grow during the summer when they felt sure that the soil needed a little shade and the rain would afford enough water to supply both the trees and the cover crops.

From this information organiculture had its inception in my case. The natural inclination to have more for doing less led to my decision to let the grass grow and mow it only a few times during the summer.

Finding competition with the commercial vegetable growers too unprofitable, I switched to raising hogs. I hauled vegetable and meat offal from town and fed it to my expanding herd, letting them run in the grove. The small damage they did to the trees was overshadowed by the amount of manure they were adding to the soil.

During the war, the effect of adding so much organic matter to the soil showed its beneficial effect. I was able to grow red and white clover, oats for hay, a cane patch, and even alfalfa to feed cows. Instead of growing only citrus (monoculture), I was able to produce a variety of crops. I erected a small silo to keep up the manure production in winter. This went into the grove and leaves gathered from the parkways in the city were spread on top of it.

Two years ago I learned about Sir Albert Howard's Indore method and I've been making compost ever since. I also apply about a half ton per acre per year of dolomite lime.

After reading about the troubles some California grower's are having with reset trees, it is gratifying to note the difference here. Several factors account for this. The original planting is made in a space about 25 by 30 feet. The sun can reach all parts of the tree, increasing the vitamin content of the fruit. In the case of a reset tree, its upper half has room for a full bath in the sun or dew and it grows more shapely, not having to struggle upward for light.

The lower half (its roots) comes into a living soil into which a couple of pounds of bonemeal have been mixed, either before or after setting the tree. This material is food for microbial soil organisms and accelerates their production of suitable food for the roots and rootlets of the growing tree. This food may be the especially phosphatic compounds that build wood (cellulose) quickly.

After tramping around the newly set tree to firm the soil around the roots as much as possible, it is watered and life begins anew. The basin that had been made around the tree to hold the water to it is filled with compost. This is covered by any mulching material available to protect the bacteria in it from the heat and ultraviolet rays of the sun and the drying winds.

The sprouting sapling is watched for signs of thirst and given subsequent waterings when Jupe Pluvius tarries too long between dunkings. If the tree is reset in the spring and kept going until the rainy season it usually can make the rest of life's stay without aid.

With the advance guard of Jack Frost comes notice to pull away the mulch from around the trunk and throw up a mound of clean soil to above the bud. This saves it should the rest be cut down by a dip of the thermometer. In the spring this mound is removed and more compost and mulch added. After about three years the wood of the trunk will have hardened sufficiently to withstand ordinary cold without damaging the bud.

In the bearing grove the cover crop is mowed or flattened with a heavy roller (grove chopper) to prevent the banking up of cold air against the trees. Soil moisture is retained by this covering and the capillary action of the compacted soil under it.

This moisture and the activity in

the soil during its presence maintains a temperature several degrees higher than a bare and loosened soil. This is in a measure a frost protection to the tree. In the spring when the wind blows and the birds' cradles in the tree tops rock, the top soil under a cover crop stays put instead of rolling off in clouds as is the case in groves bare from cultivation.

When the rainy season comes, my soil, laden with humus, will hold five times as much water as the bare sand of other groves. On the bare sand the water that is not absorbed bunches up into rivulets that grow larger and deeper as they flow, leaving tree roots exposed to wither in the wind and sun if not corrected. When the rainy season is over the trees in poor soil thirst for water to finish growing their fruit. Here the cover crop in my grove comes to the rescue again. The liberal amount of water in my grove allows the soil organisms to make more food for the trees. Next to air, water is the living organism's greatest need.

I have been able to reap extra profits from my grove both by the increased quality of the fruit and because I sell my fruit directly to the consumer in gift packages.

Nature has a way of storing up in fruits and seeds those things that are good for the health of man and beast. They are priceless and unobtainable in any other way. It is up to us as husbandrymen of the soil to learn His way so we may learn the fullness thereof.

Editor's Note: The Organic Farmer has tested six of Mr. John Volkert's oranges and six oranges purchased in a store. The results of the test showed that Mr. Volkert's oranges contained 30 per cent more vitamin C than the others.

Cotton Gin Waste

Cotton refuse is of various kinds and sold widely as a commercial fertilizer in processed form.

The cottonseed burrs are a source of potash, but need considerable moisture before breaking down into compost. The fine waste and the more voluminous amounts of wastes containing cotton fiber are, as a rule, rich in nitrogen, because seed parts and lint are contained in them. When piled up in the open, this material will decay in a few months into a rich and valuable compost without further additions. These materials can, of course, also be used to activate compost heaps by covering other plant material, including cotton burrs, with them.

In many parts of the country, small gins are operating which cannot dispose of their by-products on a commercial scale. The local farmer and gardener can get valuable fertilizer materials there. It would be foolish for him to burn cotton hulls or similar by-products, since he can compost them and get thereby not only *all* the elements, but also a considerable amount of organic matter, so that he can improve his land in two ways. If he grows figs, citrus fruit or some other orchard crop, an application of gin wastes will be especially desirable to replenish the soils in the South. As a rule, Southern soils get depleted rapidly because the higher temperatures induce high bacterial growth and thus bring about quicker depletion of the organic matter in the ground.

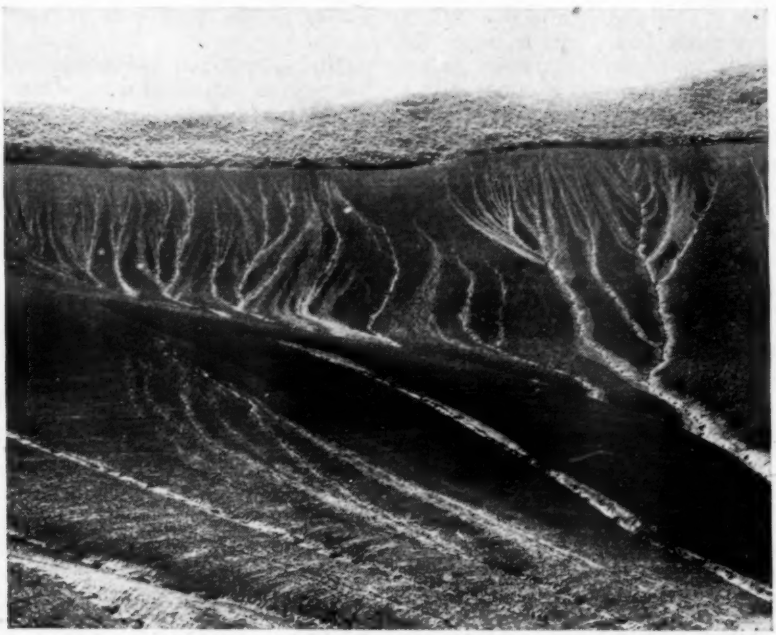
EROSION

A Disease of the Soil

By SIR ALBERT HOWARD

The Soil Washing Problem Reviewed

By The Great Organiculturist



S. C. S.

Dendritic drainage lines from a recent rain. This wasteful speeding up of natural erosional tendencies could have been prevented by the planting of a cover crop and the application to the soil of extra organic matter.

S. C. S.

The upper light layer in this picture is an erosional deposit of silt upon the original topsoil and subsoil of a river's flood plain. A change in the natural balance of the surrounding terrain caused an acceleration of erosion and an increase of silt deposits.

Reprinted from *The Agricultural Testament*

PERHAPS the most widespread and the most important disease of the soil at the present time is soil erosion, a phase of infertility to which great attention is now being paid.

Soil erosion in the very mild form of denudation has been in operation since the beginning of time. It is one of the normal operations of Nature going on everywhere. The minute soil particles which result from the decay of rocks find their way sooner or later to the ocean, but many linger on the way, often for centuries, in the form of one of the constituents of fertile fields. This phenomenon can be observed in any river valley. The fringes of the catchment area are quite frequently uncultivated hills through the thin soils of which the underlying rocks protrude. These are constantly weathered and in the process yield a continuous supply of minute fragments in all stages of decomposition.

The slow rotting of exposed rock surfaces is only one of the forms of decay. The covering of soil is no protection to the interlying strata but rather the reverse, because the soil water, containing carbon dioxide in solution, is constantly disintegrating the parent rock, first producing subsoil and then actual soil. At the same time the remains of plants and animals are converted into humus. The fine soil particles of mineral origin, often mixed with fragments of humus, are then gradually removed by rain, wind, snow, or ice to lower regions. Ultimately the rich valley lands are reached where the accumulations may be many feet in thickness. One of the main duties of the streams and

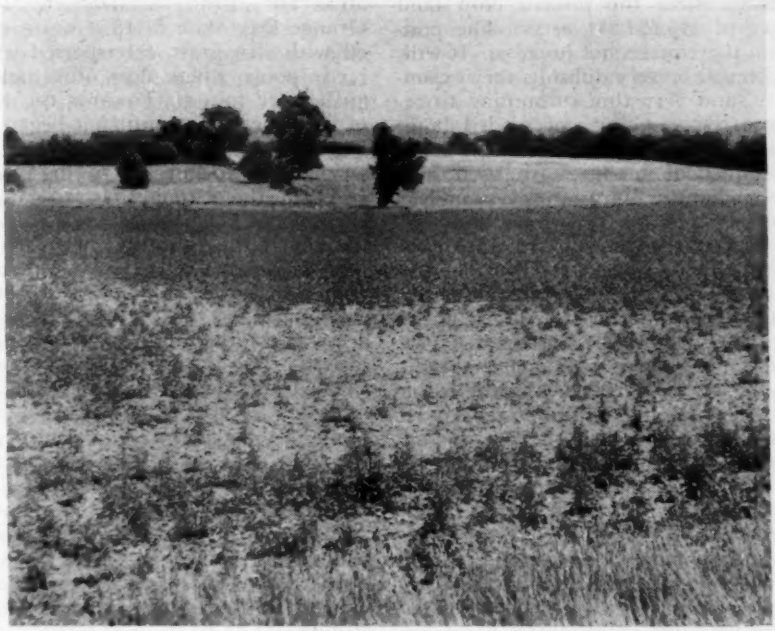
S. C. S.

The poor quality of the soil in this field prevented the absorption of rain and encouraged the washing of silt to the base of the field.

rivers, which drain the valley, is to transport these soil particles into the sea where fresh land can be laid down. The process looked at as a whole is nothing more than Nature's method of the rotation, not of the crop, but of the soil itself. When the time comes for the new land to be enclosed and brought into cultivation, agriculture is born again.

It is when the tempo of denudation is vastly accelerated by human agencies that a perfectly harmless natural process becomes transformed into a definite disease of the soil. The condition known as soil erosion—a man made disease—is then established. *It is, however, always preceded by infertility*: the inefficient, overworked, drying soil is at once removed by the operations of Nature and hustled toward the ocean, so that new land can be created and the rugged individualists—the bandits of agriculture—whose cursed thirst for profit is at the root of the mischief, can be given a second chance. Nature is anxious to make a new and better start and naturally has no patience with the inefficient. Perhaps when the time comes for a new essay in farming, mankind will have learned a great lesson—how to subordinate the profit motive to the sacred duty of handing over unimpaired to the next generation the heritage of a fertile soil. Soil erosion is nothing less than the outward and visible sign of the complete failure of a policy. The causes of this failure are to be found in ourselves.

The damage already done by soil erosion all over the world, looked at in the mass, is very great and is rapidly increasing. The regional contributions to this destruction, however, vary widely. In some areas like northwestern Europe, where most of the agricultural land is under a perma-



S. C. S.

A "soil cancer." Lack of drainage from this spot caused the collection of silt and the formation of a hard pan. Crops will not grow here until the soil is broken up and more organic matter introduced.

nent or temporary cover crop (in the shape of grass or leys), and there is still a large area of woodland and forest, soil erosion is a minor factor in agriculture. In other regions like parts of North America, Africa, Australia, and the countries bordering the Mediterranean, where extensive deforestation has been practised and where almost uninterrupted cultivation has been the rule, large tracts of land once fertile have been almost completely destroyed.

The United States of America is perhaps the only country where anything in the nature of an accurate estimate of the damage done by erosion has been made. Theodore Roosevelt first warned the country as to its national importance. Then came the Great War with its high prices, which encouraged the wasteful exploitation of soil fertility on an unprecedented scale. A period of financial depression, a series of droughts and dust-storms, emphasized the urgency of the salvage of agriculture. During Franklin Roosevelt's presidency, soil conservation became a political and social problem of the first importance. In 1937 the condition and needs of the agricultural land of the U. S. were appraised. No less than 253,000,000 acres, or 61 percent of the total area under crops, had either been completely or partly destroyed or had lost most of its fertility. Only 161,000,000 acres, or 39 percent of the cultivated area, could be safely farmed by present methods. In less than a century the United States has therefore lost nearly three-fifths of its agricultural capital. If the whole of the potential resources of the country could be utilized and the best possible practices introduced everywhere, about 447,466,000 acres could be brought into use—an area somewhat

greater than the present crop land area of 415,334,931 acres. The position therefore is not hopeless. It will, however, be very difficult, very expensive, and very time-consuming to restore the vast areas of eroded land, even if money is no object and large amounts of manure are used and green-manure crops are ploughed under.

The root of this soil erosion trouble in the United States is misuse of the land. The causes of this misuse include lack of individual knowledge of soil fertility on the part of the pioneers and their descendants; the traditional attitude which regarded the land as a source of profit; defects in farming systems, in tenancy, and finance—most mortages contain no provisions for the maintenance of fertility; instability of agricultural production (as carried out by millions of individuals), price and income in contrast to industrial production carried on by a few large corporations. The need for maintaining a correct relation between industrial and agricultural production so that both can develop in full swing on the basis of abundance has only recently been understood. The country was so vast, its agricultural resources were so immense, that the profit seekers could operate undisturbed until soil fertility—the country's capital—began to vanish at an alarming rate. The present position, although disquieting, is not impossible. The resources of the Government are being called upon to put the land in order. The magnitude of the effort, the mobilization of all available knowledge, the practical steps that are being taken to save what is left of the soil of the country and to help Nature to repair the damage already done are graphically set out in *Soils and Men*, the Year Book of the United States Department of Agriculture of 1938. This is perhaps the best local account of soil erosion which has yet appeared.

The rapid agricultural development of Africa was soon followed by soil erosion. In South Africa, a pastoral country, some of the best grazing areas are already semi-desert. The Orange Free State in 1879 was covered with rich grass, interspersed with reedy pools, where now only useless gullies are found. Towards the end of the nineteenth century it began to be realized all over South Africa that serious over-stocking was taking place. In 1928 the Drought Investigation Commission reported that soil erosion was extending rapidly over many parts of the Union, and that the eroded material was silting up reservoirs and rivers and causing a marked decrease in the underground water-supplies.

The cause of erosion was considered to be the reduction of vegetal cover brought about by incorrect veld management—the concentration of stock in kraals, over-stocking, and indiscriminate burning to obtain fresh autumn or winter grazing. In Basutoland, a normally well-watered country, soil erosion is now the most immediately pressing administrative problem. The pressure of population has brought large areas under the plough and has intensified over-stocking on the remaining pasture. In Kenya the soil erosion problem has become serious during the last three years, both in the native reserves and in the European areas. In the former, wealth depends on the possession of large flocks and herds, barter is carried on in terms of live stock; the bride price is almost universally paid in animals; numbers rather than quality are the rule. The natural consequence is over-stocking, over-grazing, and the destruction of the natural covering of the soil. Soil erosion is the inevitable result.

In the European areas, erosion is caused by long and continuous over-cropping without the adoption of measures to prevent the loss of soil and to maintain the humus content. Fields have of late been seen where the combined effect of locusts and goats has resulted in the loss of a foot of surface soil in a single rainy season.

The countries bordering the Mediterranean provided striking examples

of soil erosion, accompanied by the formation of deserts which are considered to be due to one main cause —the slow and continuous deforestation of the last 3,000 years. Originally well wooded, no forests are to be found in the Mediterranean region proper. Most of the original soil has been washed away by the sudden winter torrents. In North Africa, the fertile corn fields which existed in Roman times are now desert. Ferrari in his book on woods and pastures refers to the changes in the soil and climate of Persia after its numerous and majestic parks were destroyed; the soil was transformed into dust; the climate became arid and suffocating; springs first decreased and then disappeared. Similar changes took place in Egypt when the forests were devastated; a decrease in rainfall and in soil fertility was accompanied by loss of uniformity in the climate. Palestine was once covered with valuable forests and fertile pastures and possessed a cool and moderate climate; today its mountains are denuded, its rivers are almost dry, and crop production is reduced to a minimum.

The above examples indicate the wide extent of soil erosion, the very serious damage that is being done, and the fundamental cause of the trouble—misuse of the land. In dealing with the remedies which have been suggested and which are now being tried out, it is essential to envisage the real nature of the problem. It is nothing less than the repair of Nature's drainage system—the river—and of Nature's method of providing the country-side with a regular water-supply. The catchment area of the river is the natural unit in erosion control. In devising this control we must restore the efficiency of the catchment area as a drain and also as a natural storage of water. Once this is accomplished we shall hear very little about soil erosion.

Tankage

Tankage is refuse from slaughterhouses and butcher shops other than blood freed from the fats by processing. Depending on the amount of bone present, the phosphorus content varies greatly. The term *tankage* does not indicate anything as to the nitrogen or phosphorus content and the individual lot must be inspected as to its analysis.

The nitrogen content varies usually between 5 and 12.5 per cent, the phosphoric acid content is usually around 2 per cent, but may be much higher.

Considering that a hundred pound bag of tankage may contain five pounds of nitrogen, it would be equivalent as a compost activator to half a ton of fresh horse manure. Considering, however, that such an amount of horse manure contains also other valuable fertilizer agents, a rich flora of bacteria, and numerous hormones, it may be wise to investigate if manure cannot be secured and employed more profitably. Where tankage is rendered there are usually stock yards or comparable establishments that sell manure. The advantage of dried blood and tankage is, of course, their concentrated quality and ease of handling.

Farm Practices Influencing The Incidence of Multiple Sclerosis

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MAN'S kinship with and dependence upon the soil are expressed by Dr. V. G. Simkovitch, "Go to the ruins of ancient and rich civilization in Asia Minor, Northern Africa, or elsewhere. Look at the unpeopled valleys, at the dead and buried cities, and you can decipher there the promise and the prophecy that the law of soil exhaustion holds in store for all of us. Depleted of humus by constant cropping, land could no longer reward labor and support life, so the people abandoned it. Deserted, it became a desert; the light soil was washed by the rain, and blown around by the shifting winds."

In the occurrence of multiple sclerosis in Germany, England, Northern Europe in general, and the United States, where large amounts of inorganic, incomplete chemical fertilizers are used by farmers, in contrast to the absence of multiple sclerosis in China, Japan, and India where natural fertilizers or manures are used, nature presents us with a challenging fact.

Farm practices which influence the total quality of the crop and, in turn, the quality of man's food are the concern of this paper. Thus, the soil as a source of man's food, especially the trace elements, becomes the physician's problem. The doctor must demand that the agriculturist produce a food that will meet the multiple protoplasmic needs for optimal growth, development and function. Prescribing a good diet is not enough. There is a very wide variation in the composition of fruits, vegetables, grains and meat, milk and eggs, when produced on different soils, in different sections of the country, on different farms, or even on different fields of the same farm. The Peckham Pioneer Health Service Centre in England discovered that feeding families in the Centre with ordinary, so-called balanced food diet brought from a shop was not enough. They were forced to grow the food themselves and to use not new methods but the ancient method of returning waste to the soil. Man's interference with the perfect balance between the natural processes of growth and decay may be largely responsible for the predicament of our malnutrition, in spite of adequate diet by the present standards.

A fertility that is optimal for the production of nutritional foods depends not only upon various elements, humus, physical structure, tillage, moisture, sun-light, but also upon the fauna and flora of the soil. Microorganisms play an important part in making air nitrogen available to plants and in the decomposition of humus. Mycorrhizal fungi surround rootlets and stimulate metabolism as a living fungus bridge which connects soil and sap.

In this discussion our interest centers in deficiency in the trace elements (iron, cobalt, copper, zinc, chlorine,

sodium, magnesium, manganese, sulphur, silver, boron, nickel, aluminum, arsenic, fluorine, iodine)—all protoplasmic needs known and unknown that are influenced by farm practices. The soil is being depleted of its fertility by large urban populations and industries. The maintenance of fertility is a farmer's problem, but the food that the American people consume is everyone's problem. Farm practices must protect and maintain this fertility in order that we may be able to buy foods that have the capacity to give optimal nutriment to our bodies.

The soil of England was being depleted in 1836 when Carswell first noted a multiple sclerotic pons and cord, as an interesting neurological specimen. The soils of France were being depleted in 1839 when Cruveilhier described the neuropathology of multiple sclerosis and gave two case histories. A few years later in France, Charcot gave us a description of the clinical and pathological pictures of multiple sclerosis. The soil of Germany was being depleted in 1840 when a chemist roughly "analyzed a human body." He found calcium, nitrogen, phosphorus and potassium in addition to water. His crude methods showed the same elements were present qualitatively in plants and animals, and he concluded that as long as these elements were replaced in the soil in generous quantities, neither plants nor people would suffer from malnutrition.

Thus, we see that multiple sclerosis, depletion of soil, and the introduction of inorganic chemicals as a treatment for the soil were all introduced to man between the years of 1836 and 1840.

A century ago, the prevailing practice in agriculture was to take from the soil without adequate replacement of its store of minerals and humus. Cropping had become so intense in Germany, France, and England that nature could not replenish the soil. The natural process of laying down top soil was too slow. The introduction of inorganic chemicals resulted in quantity production of food. The incompleteness of the chemicals used, and their tendency to accentuate incipient deficiencies of certain other elements in the soil, is now being recognized by agricultural research.

There have been many suggested causes for multiple sclerosis, but there has been no proven etiological factor to explain its incidence.

My observation has been in agreement with other neurologists in regard to the conditions that precipitate this illness, namely, pregnancy, infections, inorganic chemicals, trauma, strains and stresses, exposure, vaccines, marriage, emotional upsets, lumbar punctures, and gross dietary restrictions. There is one common feature in all of the various things which precipitate the attack, increased demand on the human body. It follows that these factors can only precipitate the illness in individuals who are vulnerable. The geographic distribution of the incidence points out those who are relatively protected and those who are candidates for multiple sclerosis when hit with sufficient force by a precipitating factor.

Who Are The Vulnerable?

Multiple sclerosis, though thought by many doctors to be rare, and almost unheard of by the public, caused 1301 deaths in the United States in 1944 as compared with 1361 deaths from infantile paralysis and 2045 deaths from pernicious anemia. Multiple sclerosis is both less recognized by the physician and more crippling to the patient than infantile paralysis. In the New York City area in the first 46,875 selectees examined, 29 were found to have multiple sclerosis while 734 had tuberculosis, 170 had diabetes, and 8 had pernicious anemia. During 1933 a study of chronic illnesses in 113 New York hospitals revealed 1050 cases of multiple sclerosis and 551 cases of pernicious anemia among a total of 573,623 cases. A survey in Switzerland disclosed 36 multiple sclerosis cases per 100,000. In one locality there were 70 per

100,000. A survey in England and Wales showed 16 per 100,000.

In order that we might have a better concept of the incidence of multiple sclerosis in the United States, I obtained, through the courtesy of the United States Department of Public Health, the statistics on the number of deaths that occurred in each state during the year of 1944. I also obtained this data on infantile paralysis and pernicious anemia during the same year for comparison.

There is the high urban and low rural incidence of the disease. Contrary to the general impression, it is shown that multiple sclerosis is not rare in the southern states. I believe there is a tendency for the prevalence of multiple sclerosis to be in direct ratio with the number of neurologists in the respective states. I have seen patients from every southern state east of the Mississippi. There figures are on the low side due to diagnostic error and intercurrent infection's being recorded as cause of death in patients with multiple sclerosis.

Multiple sclerosis could not well be a deficiency disease in the usual concept. The Chinese caloric intake is from 2000 to 2500 per day. The Chinese diet is deficient in calcium, in vitamins, proteins and fats. Yet the Chinese do not have sclerosis of their nerves, their blood vessels, blockage of their veins or hypertension. They do not have kidney or gall stones. They have limited food supply, but this food is better suited to meet man's body needs as evidenced by the absence of degenerative diseases, in spite of the high incidence of infectious diseases. Their limited supply of food is grown by farmers who do not use inorganic chemicals which, in the light of present knowledge, tend to disturb the chemical balance of the soil and, in turn, to disturb the mineral and chemical content of the crops and, thus, affect the health of the animals that feed on the crops. The Chinese do not have multiple sclerosis.

What evidence is there that the absence or insufficiency of trace elements affect plants and animals? Kenneth G. Beeson writes, "The recent increase of interest in the distribution of nutritional trouble in plants and animals is a natural sequence to the earlier work of diagnosing and classifying these troubles and their symptoms." He gives three United States maps—first, of the occurrence of boron and manganese deficiencies in plants,—second, of the occurrence of copper, iron, magnesium and zinc deficiencies in plants,—and third, of the occurrence of mineral nutritional diseases in animals, namely, cobalt, copper and iron causing nutritional anemias, calcium and phosphorus causing bone diseases, selenium toxicity and grass tetany.

The 1943 Report of the Administrator of Agricultural Research discussed the soil-plant nutritional relationship. "Cattle in areas where cobalt is deficient in native plants become gaunt owing to loss of appetite, become listless and anemic; the hair coat becomes rough and the skin is scaly. After extended exposure to the deficiency, muscular atrophy develops and death occurs. In North Carolina, cobalt deficiency is accompanied by a low manganese content of the forage; while in Massachusetts the iron content is low. These multiple deficiencies have prevented a normal development of dairy and beef cattle. Trouble with sheep and dogs also occurs in North Carolina in those areas where the soil is depleted of certain trace elements."

A survey was made of pastures and hay lands in the Northeast where an ailment in cattle, called grass tetany, has been reported to be associated with intensive fertilization with nitrogen, potash and phosphate.

What is the relationship of mineral imbalance in soil, plants and animals to multiple sclerosis? In animals that live on food from soils depleted of some elements such as cobalt, manganese, iron, et cetera, or from soil overfertilized with nitrates, potassium and phosphates, evidence of central nerv-

ous disease is found.

"The fertilization may possibly have accentuated incipient deficiencies of certain other elements in the soil. Preliminary results with new techniques developed by the laboratory to study the effects of fertilizer and soil treatments on the mineral content of food and forage plants indicated that the amounts present in minute quantities in both hay and green vegetable crops are affected by liming and fertilization practices. On the basis of these results it seems possible that modifications of liming and fertilization practices may result in an increased content of some of the essential elements in soils" and in foods. Thus, circumstantial evidence points to the fact that unbalanced chemical fertilizers, either too much or too little, or in the wrong combination of minerals, interfere with the soil's ability to supply the necessary chemical elements for healthy plants and animals.

"The plant needs varying amounts of different elements, much of one, little of another; for example, cotton as a general rule needs at least 36 pounds of nitrogen, equivalent to 225 pounds of natural nitrate per acre. Natural nitrate contains a large amount of nitrogen, 16 pounds per 100, but application of 100 pounds per acre would not be adequate to correct the nitrogen deficiency of the soil as measured by the requirements of the cotton plant. On the other hand, "saltsick" (an anemia) of cattle feeding on certain pasture land in Florida is prevented by addition of a trace of cobalt to the fertilizer treatment. Application of a little zinc oxide per tree, or driving one small zinc-covered nail in the orange tree, controls the mottle-leaf disease for a period of several years."

Composts of vegetable matters and animal manure contain all of the known elements contained in the human cell and likely many other factors needed by the human cell that are as yet unknown to the biochemist. Thus, natural manures have the potential the Chinese have returned to the land capacity to give to the depleting soils a complete fertilizer, while the chemical fertilizer is an incomplete food supply for the plant and will continue to be until we perfect and advance our knowledge of microbiochemistry. Therefore, full quality food can only be raised on virgin soil and on soil that has been replenished by the refuse from all of its produce, both plant refuse and animal refuse.

The natural phenomenon that nature has presented for us of multiple sclerosis's occurring here and not there, of its occurrence only in places where incomplete, commercial fertilizers are used in farm practices, presents for our consideration an experiment that has been carried on for over a hundred years. The subjects and potential subjects run into the millions. In order that we may have a limit to our geographic research, let us again take China, which has an estimated population of 450,000,000 people and is 90% rural, and Germany, which, as greater Germany, had an estimated population of 79,000,000 people, with a rural percentage much smaller than China but which cannot be ascertained exactly. The time element in this experiment goes back a century. I do not think statisticians could question the number nor the time of this experiment. The Chinese farmer uses natural manure to produce his food; the German farmer uses inorganic chemical fertilizer to produce his food.

In 1840, von Liebig introduced the practice of applying inorganic material to the lands as fertilizer to replenish the depleted soils of Germany. This practice spread rapidly, and it became customary to apply mainly nitrates, potassium, phosphorus and lime. This incomplete fertilizer provided the major needs of the soil but overlooked the minor needs, minor though equally vital to the soil. On the other hand, in China the agricultural practice of intensified farming demanded that the depletion of these soils be prevented. For centuries the refuse of the products of the soil and the manures of animals, including

man. In Germany before the war, multiple sclerosis was second only to syphilis in causing pathology of the nervous system. In China multiple sclerosis is such a rarity that authorities, such as Snapper and others, state that it is non-existent.

Where soils are depleted of certain minerals, biologists tell us of deficiency disease in plants, and they have found that very small amounts of the proper minerals added to the soil will eliminate the deficiency disease. For instance, in New Zealand there was a soil deficiency of cobalt in the grasses that made the pasture, which in turn caused the sheep to become paralyzed. The application of three or four pounds of cobalt per acre prevented the deficiency of the grass and eliminated the bush paralysis in the sheep.

In spite of our present knowledge of chemistry and of chemical fertilizer, we have not developed a technique to determine the minute traces of iron, cobalt, copper, boron, zinc, chlorine, sodium, magnesium, manganese, sulphur, and perhaps many other chemical substances, that are needed by plants. It is true that plants can grow without these trace elements, but in order for them to give a complete optimal diet to the animals that feed on them, they must be grown on a soil that is a completely fertile soil. Until we develop further knowledge of soil and plant chemistry, reliance can be placed only in the natural manures that give a more complete and balanced fertilization.

In Summary

We have a story of depleted soil, soil that man in the western world has attempted to correct by the use of a few chemicals. These chemicals are inadequate to meet the full needs of plants and animals as they represent only a few of the protoplasm's mineral needs. These chemicals have the capacity to disturb the mineral balance and the natural fauna and flora of the soil. People whose food comes from soils fertilized with chemicals appear to have more degenerative diseases, more vascular diseases. Multiple sclerosis is a degenerative disease. Its clinical characteristic of acute or subacute onset, with symptoms that improve or disappear, points to involvment of the circulation.

People who are fed on food produced by incomplete, inorganic fertilizers appear to be more liable to circulatory disease, more liable to central nervous system circulatory disease, more liable to vascular constrictions and dilatations, more liable to perivascular infiltration and to edema in their nervous systems and local glial proliferation due to disturbed mineral balance in their bodies and their blood streams. Therefore, when greater demands, (the precipitating factors of multiple sclerosis), are put on their vulnerable bodies, these people develop the syndrome of multiple sclerosis.

The conclusion, thus, is indicated that the incomplete fertilization program carried on in Germany, England, Europe, and the United States is contributing largely to the inadequacy of the quality of the diet, with deficiency of trace elements and unknown factors, contributing to and being largely responsible for the presence of multiple sclerosis in what appears to be ever-increasing incidence in the occidental world. It is also indicated that the use of complete and natural manures in the oriental world may be the factor in producing a more adequate diet, thus, explaining the orient's freedom from multiple sclerosis and some of the other degenerative diseases.

BARBERRY ERADICATION CONTROLS STEM RUST

By W. M. WATSON

Reprinted from the *Southern Planter*

AN extra eight bushels of wheat from each acre of land, with no increase in cost of production and with no change in cultural practices or varieties grown, is really something to brag about. That's the kind of bragging you hear in the Virginia communities where the stem-rust disease of small grains has been controlled by barberry eradication.

A survey made among 140 Virginia farmers in areas cleared of the rust-spreading barberry reveals that the yields of wheat increased an average of 68 per cent during the five years following barberry eradication over the average yields for the five years prior to the time that the eradication work was done.

Farmers are generous in their support of this cooperative State-Federal program that has stepped up their yields and increased their income. The news of the higher yields and better-quality crops gets around, too. Each year the requests that come in to the Virginia-West Virginia barberry office, at Bluefield, from farmers for work on their farms far exceeds the facilities available to do the job.

The native barberry, called *Berberis canadensis* by the botanists, grows in abundance in the pastures and along fence rows bordering the fields of wheat and oats in the valleys of southwestern Virginia. Another species, known as the *vulgaris* barberry, which was brought to Virginia by the early settlers for hedge and ornamental use, is found principally in the northwestern counties.

Once this stage of the disease becomes established in a grain field, it spreads from plant to plant, from field to field, and from one community to another over wide areas. When the rust is produced, and in this form the the disease is spread to nearby grains and grasses by wind-borne spores.

Barberry plants rust in spring, and grain ripens, a winter stage of the disease lives through the winter on wild grasses, straw and stubble. In the spring, the rust goes back to the barberry to start again on its destructive annual cycle.

Barberry bushes are guilty on two counts—(1) they start destructive local epidemics of stem rust in fields of wheat, oats, barley and rye, and (2) races of the stem rust are produced on the leaves of the barberry. Some of these may be new and more virulent than any of the races that are now known to exist and may be capable of attacking varieties of grain heretofore considered resistant.

The problem plant breeders have in producing rust-resistant varieties of grain is complicated by the existence of these many races of stem rust and by the fact that new races may be developed by known races cross-breeding on the barberry.

The presence or absence of certain virulent races in different crop regions explains why the same variety of grain may appear resistant to stem rust in one region and susceptible in another during the same year and under similar conditions. There are 213 numbered rust races, of which 189 attack wheat, 12 attack oats, and 14 attack rye. Some of the wheat and rye races also attack barley.

Barberry bushes were so numerous and widely scattered before eradica-

tion work was started that nearly all grain fields were within striking distance of the disease. And even now, in many unworked areas at the right season of the year, the relationship between the rust and the barberry bushes is so clear that the untrained eye can pick out the limits of the rust spreads.

Since 1934 more than 150 million barberry bushes have been destroyed on 4,180 properties in the principal small-grain areas in Virginia. The eradication program has precluded further spread of this plant pest and contributed much to the control of the rust disease.

In this control program it is important to emphasize that barberry-infested territory must be reworked one or more times before the operation is complete. Seed of the barberry may lie dormant in the soil for 10 or more years before germinating. Consequently old established areas present a problem for several years after the initial eradication work. An effective program requires timely rework—usually at an interval of five years—to preclude production of seed by new bushes and subsequent reinfestation of the area. Territory where there are no barberry bushes found on the initial coverage is not scheduled for any future work except that which is necessary to keep it in a barberry free condition.

S. B. Fenne, plant pathologist for the Virginia Agricultural Extension Service, reports that Virginia farmers lost 2,500,000 bushels of their wheat crop during the period 1941-46 owing to damage by stem rust. In some years farmers in barberry-infested territory have lost as much as 50 to 60 per cent of their crop, and losses of 10 per cent have been rather common.

The barberry-eradication program is paying yearly dividends. However, really effective control will not come until it is possible to extend the project activities to other heavily infested areas of the State. In the meantime, farmers should practice all practicable preventive measures. Barberry bushes growing adjacent to the grain fields should be eradicated. Every barberry bush destroyed means one less source of stem rust. If available, rust-resistant varieties of grain recommended by the experiment station should be used.

The Community "Clean Egg" Nest

By D. C. KENNARD and V. D. CHAMBERLAIN

Reprinted from *Ohio Farm and Home Research*

THERE is plenty of room for improvement in poultry nests. The newest departure from the conventional, single nest is the one-tier community "clean egg" nests which are similar to wide box nests with hinged top and small front entrances to make them darker inside.

Many poultrymen are finding the community nest the best of all, especially for the heavy breeds. In the use of these nests at the Ohio Agricultural Experiment Station, the nests have had the following advantages:

1. Being well darkened and easy to enter, the nests offer greater attraction for hens to lay. This means fewer floor eggs, less breakage, and discourages egg eating and cannibalism in the form of "pickouts".

2. The nesting litter is 3 to 4 inches deep and keeps clean longer. With most of the light excluded, there is less scratching and confusion, aiding in the prevention of breakage and soiled eggs.

3. The layers prefer the community type of nest to individual or rear entrance box nests.

The Importance of Bi-Sexual Grazing

By MAURICE RENSHAW

From *Mother Earth*

I wonder if sufficient thought is given to the need for grazing the bull with the cows, or, if he is kept housed, to ensuring that his dung is confined to this section. It is quite contrary to nature for land to be grazed solely by female animals; and I have long been of the opinion that most reproductive irregularities, such as failure to cleanse, abortion, leucorrhoea and mastitis, which are so increasingly troublesome today, are due to this cause. Possibly the sex-hormones, and other substances about which we know so little, are required from both male and female urines if the fertility cycle is to be completed. I believe this was known in olden days; for where no bull was kept, a billy goat was often run with the cows—folk-lore, of course, without scientific 'proof', but none the worse for that.

I am a little perturbed at the present tendency to emphasize the importance of scientific 'proof'. Scientific knowledge is but partial knowledge, and so is apt to lead off at a tangent, each set of facts demanding a further set of facts to support it. My own view is that we can take part in the wholeness of life without precisely understanding it, and give practical effect in our lives to a greater understanding than all science can ever add up to, simply through a feeling for the nature of things. I like to remember that we are ourselves a part of what we are trying to understand, and that an effort to achieve objectivity must lose us in some ways as much understanding as it gives us in others. Our apparent need for science is the measure of our original departure from wholeness, and science accentuates that departure.

Here are a few interesting little bits of evidence that may help.

1. The year before last, seven geese here all chose to lay their eggs round the foot of an organic compost heap; not one egg was laid in the chemically-activated heap (straw with nitro-chalk) alongside, though it looked the more inviting of the two since it still had unrotted straw.

2. Pigs gathering food under oaks always dung in a ring round the trees corresponding approximately to the farthest reach of the branches, leaving untouched the acorns which fall amongst the dung. Are they thus providing for future oaks in conformity with some ecological law of plant and animal interdependence?

3. Shallots top-dressed with fresh compost have shown a very marked resistance to onion mildew, as compared with the other half of the plot, which was dunged in the orthodox way.

TOBACCO STEMS

This material is frequently used for mulching. The mulches disintegrate gradually and supply the soil with nutrients, without adding any poisonous substance, because nicotine disintegrates into its elements. The nutrients contained in a hundred pounds of tobacco stems are 2.5 to 3.7 lb. of nitrogen, almost a pound of phosphoric acid, and from 4.5 to 7.0 lb. of potassium. Thus tobacco stems make a good potash fertilizer in organic form. Where ample green matter is available for composting, there is little occasion to purchase tobacco stems additionally.

Feed Supplements To Pasture

Organic minerals—not protein percentages—are the vital elements of your poultry ration: as tests by three outstanding poultry specialists show.

By
D. C. Kennard, L. E. Thatcher, and V. D. Chamberlain

Reprinted from *Ohio Farm and Home Research*

GOOD range and pasturage offer the best opportunities for reducing feed costs in production of pullets for egg production and for the production of four- to six-pound chickens for marketing. How then can these opportunities be realized by poultry raisers to the fullest extent? What feed is necessary to supplement pasturage for satisfactory growth of chickens? To answer these questions, extensive experiments have been in progress during the past four years at the Ohio Agricultural Experiment Station.

What is Good Range and Pasturage?

Despite new information now available relative to nutritional requirements for the growth of chickens indoors, a good range which provides ample pasturage continues to be the most efficient and economical way for most poultrymen to raise pullets and chickens for marketing. The outdoor range provides well-recognized advantages, such as fresh air, direct exposure to sunshine, more exercise, and pasturage which includes succulent green feed, bugs, insects, worms, and the like.

Moreover, the outside range can provide the necessary isolation of young chickens from older ones during the growth period when the young are most susceptible to diseases and parasites of older birds, which must always be considered as carriers. In fact, effective isolation (which can be realized by a suitable outside range) is often the prime factor in determining the success of the new crop of chickens each year. The pasturage may be edible grass and weeds, clover, alfalfa, or best of all, Ladino clover.

Three Range Rations

In early tests it was found that chickens which received free choice of whole grain and a 19-percent protein mash when on a good range balanced their diet with protein at the rate of 14 percent of their total feed intake. It was from this basis that the Ohio Station's special 14-percent protein, whole oats-mash range ration was derived. This proved a highly satisfactory ration and method of feeding chickens on range after the first eight weeks. Being an all-in-one, whole oats-mash mixture, it was found preferable to the feeding of whole grain and mash separately. This ration with its greater protein and mineral content was found the most satisfactory for supplementing pasturage other than Ladino clover.

Then the question arose as to whether a 12-percent protein ration, with a saving of nearly half of the protein meals, might likewise meet

the requirements for satisfactory growth of chickens having access to Ladino clover pasturage. The 12-percent protein ration did prove equally satisfactory.

Minerals More Important

The surprisingly good results secured from the 12-percent protein ration suggested that perhaps it was not the protein content but rather the mineral content that was mostly responsible for its success. If so, could similar results be secured from the use of corn, minerals, and Ladino clover? Seeking the answer to this question led to the discovery of the corn and minerals ration which appears to be the final answer to the question: What is the simplest feed necessary to supplement a good range and Ladino clover pasturage for the satisfactory growth of chickens? Thus, it proved to be the minerals which were the missing links responsible for the previous failure to secure satisfactory growth of chickens on Ladino clover pasturage when they received whole grain without mash.

This last named ration consisted of whole corn or wheat free choice, 90 pounds of coarsely ground corn, six pounds of bonemeal and two pounds each of oystershell or limestone grit, granite or gravel grit, and salt.

Three Methods of Feeding Corn and Minerals

The corn and minerals ration may be fed by three different methods: (1) the free choice of whole corn and a ground corn-minerals mash; (2) the free choice of whole corn and the minerals in separate feeders; and (3) an all-mash mixture of coarsely ground corn and the minerals.

In an experiment with Leghorn pullets, little difference in body weight was evident among the three methods of feeding corn and minerals. There was, however, a lower (9 percent) feed consumption by the pullets that received whole corn and minerals in separate feeders, but this was not true with one test with R. I. Reds. More experiments will be necessary to establish the comparative merits of the three methods of feeding the corn and minerals ration. Until then, the feeding of whole corn and minerals in separate feeders may be considered questionable. This procedure has the further disadvantage of having to provide a special weather-proof feeder for the minerals.

Ladino Clover Versus Bluegrass and Farm Pasturage

Is Ladino clover necessary to secure the greatest benefits and economy from pasturage or may a grass or run-of-farm range serve much the same purpose? This question is answered in four experiments involving 725 Leghorn and 2,250 R. I. Red pullets.

Pullets on Ladino clover pasturage made a consistently faster rate of growth with less feed than did similar pullets on bluegrass or run-of-farm ranges. Leghorns on Ladino clover made 11 percent greater growth with 12 percent less feed than did pullets on bluegrass range. R. I. Red pullets made nine percent faster growth with 12 percent less feed than did similar pullets on run-of-farm range.

In one test R. I. Red pullets receiving the 12-percent protein ration and Ladino clover made 17 percent more growth than did similar pullets on run-of-farm range that received the 14-percent protein ration. Feed consumption of both groups was much the same.

The faster rate of growth of pullets on Ladino clover pasturage with approximately 12 percent less feed indicates the distinct advantage and economy in raising chickens on a range of Ladino clover. Ladino clover, with its greater protein content and greater palatability throughout the growing season, permits the successful use of the 12 percent protein ration or the corn and minerals ration. These rations, with Ladino clover, enable the poultryman to realize greatest economy in raising his chickens on good range and pasturage.

SAVE THAT RAINDROP

By C. M. BLAKE

Reprinted from *Bio-Dynamics*

WE MIGHT well give greater attention to regulating the moisture content of our soils, since it has been shown that attention to this problem can produce adequate crops from soils of only medium fertility.

There are many governing factors here, over which the farmer and gardener have no control: the topographical, hydrogeological, climatological, etc. Yet, while we cannot control the weather, judicious use can be made of the weather pattern in our local region. And it is possible to influence moisture accumulation and retention to varying degrees in connection with the mechanical means of soil manipulation, the moisture range at which our tillage operations are performed, the measures available for soil and water conservation, the building of humus in the soil, and proper drainage and aeration. This discussion does not go into questions of irrigation, which for practical and economic reasons can only be practiced on very limited areas.

Since there is a ratio between the richness of the soil and its capacity to absorb and retain moisture, we may put the humus content (used in a broad and comprehensive sense) at the top of the list of controllable factors. Included here are the effects of new plant growths and of the processes of decay and dissolution. Where growth and decay are in balance and nature's building program is undisturbed, the beneficial soil population increases by leaps and bounds because there is plenty of food and an inviting environment. Ants, beetles and earthworms can be seen going about their business of boring, tunneling and burrowing, which of course adds up to aerating and draining. Thus the work of this soil population helps provide the means to assist the gravitational percolation of water without creating large voids that might temporarily break the chain of capillary rise or induce the loss of moisture.

Clearly, the creation or the retention of humus in the soil is something within the province of the landlord to assist, and can not be blamed wholly on an unkind providence. Almost everyone is familiar with the means at hand here: the return of animal manures and waste products, the growing of cover crops, intelligent rotations, etc. If there is suffering from drought, it is therefore time that the farm operator assumed his due proportion of the blame and responsibility.

Mechanical treatment of the soil (all forms of tillage practice) should be coupled with humus building as a means of conserving moisture. The two ought to have equal rank. The writer has no intention of implying that fertility can be plowed into the ground or the structure of the aggregates (soil particles) improved thereby. "Plowing"—and the term is here used to cover a wide range of practices

—most frequently has the opposite effect, especially with respect to the conservation of moisture and the structural improvement of the soil.

It is the opinion of the writer, based on his personal observation, that the farmer has been just as profligate with moisture as he has with soil in his "plowing" operations; and for no good reason, except the excuse of saving time, when in fact it has usually meant the loss of time and of moisture as well. This most often occurs through the use of the tillage implement at the wrong moisture range, releasing both adequate and surplus moisture to the wings of the wind and normal atmospheric absorption. Too often the cause is impatience—"to get it over with"—when a slight delay, and the use of a tool better adapted to conserve, would have paid a rich dividend. Every year much soil is destroyed for the operational season by being handled too wet. And while damp humus soils attract the rain water and hold it, we can observe that soil which is dry and not protected by plant covers, or lacking in humus, either loses the rain as fast as it falls or is itself washed away by it.

While considering the fundamentals of soil moisture conservation, it might be well for the plant grower to evaluate some of the mathematics and physics involved in the process. The manufacturer of an industrial product calls on his engineering staff for weights, composition, and all discoverable scientific and supply facts relating to the raw materials, before he makes his plans and final decisions. The "food manufacturer" is confronted with similar problems.

It is true, of course, that the farm operator has no control over the ultimate supply or date of delivery of the most precious ingredient of his raw materials—water. For this very reason, in connection with the planning of his crops, the preparation of his seed beds, and the cultivation of the growing plants, these thoughts should always be uppermost in his mind: Am I doing that which will conserve the most moisture in the soil, and which will maintain it in such a manner as to absorb the greatest amount of rainfall which is likely to follow?

It is well at this point to evaluate the raw materials with which the planter works. To start with, the writer would like to impress on the reader that the weight of water, at a given temperature, other things being equal, is a constant. But this is not true of earth, since every type of earth or rock will have a different specific gravity. When the soil itself (that part of the earth's mantle occupied by the roots of plants) is given consideration, the weight range is one of wide variation. It depends on the type of soil, the humus content, percentage of voids, extent of artificial disturbance and other reasons. The better the soil, the lighter in weight (greater degree of porosity) and the more water it will contain at complete saturation in proportion to both its weight and volume. Thus earth weights are subject to the widest variations, and only an average or typical condition can be described.

Since an acre of soil is composed of 43,500 square feet, then this, considered to a depth of one foot, gives us 43,500 cubic feet—in the parlance of the engineer, an acrefoot. This can be taken as a working example. However, the writer does not wish to imply that only one foot in depth affects the total moisture supply. For this in part is influenced by the underlying strata to the first aquiclude (rock strata practically impervious to water) and also by the topographical features of the acre under consideration and its surrounding regional features.

What this acrefoot of earth will weigh (dry weight) is subject to such a wide variation that it is difficult to select an example. Soil types and their mixtures, and humus and organic content, will have much to do with the weight, and the variation will be further influenced by the amount of air in the soil. Sands will generally be the heaviest and clays the lightest, and the weight ranges may extend

from far below seventy to more than one hundred pounds per cubic foot. Eighty pounds is a good average weight for silt loam, and since it is inclined to the middle bracket, it can be used for an illustration. Good soil generally weighs less, and subsoil will weigh more. If we use the eighty pound figure, then an acrefoot of earth will weigh 3,484,800 pounds, or 1742.4 tons.

Since the average tillage tools do not disturb more than the top six inches of soil, the part of the acrefoot manipulated in tillage will weigh just half of the foregoing. To make it easy, it can be said that the acrefoot will weigh 1,700 tons and the plow layer of an acre 850 tons.

The weight of a cubic foot of water at 39.2° Fahrenheit is 62.4 pounds. Since we can conclude therefore that the weight of water in rainfall throughout the season is almost a constant, we can calculate that the weight of an inch of rainfall per acre is 113.256 tons. Allowing for temperature variations, it can be considered to be 113 tons without grave error. If we evaluate a mean annual rainfall of forty inches in the temperate zone, this would therefore be a weight of water equaling 4,520 tons for each acre of land. This is equal to the dry weight of that land to a depth of thirty inches plus.

The size and shape of the soil grains and the percentage of organic content have to do with a soil's porosity and hence with the amount of water and air containable in a given amount of soil. Soil must have both air and water, and they follow each other in regular rotation. The water fills the voids and flushes out the air, which again infiltrates as the moisture is used up or drained off. Due to the type and condition of soils, there is a wide variation in the percentage of voids (interstitial cavities) and hence in the moisture absorption and retaining capacities.

In this connection, assuming the porosity of a cubic foot of silt loam to be 48%, then the number of inches of water containable in this soil, saturated, will be 829.44 cubic inches as against a mass of 1,728 cubic inches of volume to contain it. It has been determined, by scientific tests, in accordance with such a granular structure and its consequent porosity, that five inches of this water can be retained against the force of gravity by the attraction of capillarity. However, the foregoing is only projected as an example, and is from the best type of soil. For most agricultural soils, the range of porosity will vary from twenty to thirty-five percent. Previously mentioned factors of soil structure, organic content, soil population, etc., change the water absorption capacity of a soil. The higher the humus content, the better the natural balance, the more moisture the soil can absorb and retain.

It might be asked: Why then do most soils dry so easily and why is there not always sufficient moisture in the soil? Before disturbance by profligate man, drought as we know it now was at a minimum. At that time, when there was a humus-filled soil, there was nearly always plenty of moisture to sustain vigorously growing plants. Nature stored it in the earth in the Winter and Spring. Runoff, the bane of present existence, was at a minimum. Springs and streams that are now seasonal in their activities then flowed the year round. The soil and the underlying earth was strong and able to protect itself against the ravages of natural erosive agencies. Nature never intended a barren landscape. Such was not visible before the profligate soil miners destroyed the "glue" that bound the immediate surface crust to the interior. "Save the surface and you save all," the popular slogan of a paint manufacturer, might well become the motto of the conservationist.

Before disturbance, a heavy shield of trees, grasses and all kinds of plants covered the earth and protected it against the direct rays of the sun. This same principle is still at work where it is unhindered, and the desire of the

earth to clothe itself can be observed on every hand. A plant growing alone will reach out and endeavor to cover all possible space around itself. The same plant in a cluster will reach out to the sun. This can be noted also of the trees in the forest. The forces of nature are constantly at work, and the forces of equalization are endeavoring to correct any imbalance in the earth and the atmosphere that surrounds it.

Time is the most important element in the restoration of soil. However, a wiser tillage practice with respect to moisture range can be initiated at once, and can exert a profound seasonal influence on the soil's capacity to retain moisture. When the prairies and valleys were first plowed, the correct moisture range for tilling was a long one. But with the present generally low humus content of the soil and its consequent effect on moisture-retaining capacity, there is a much narrower working range. This is for the very good reason that little time elapses between the soil's being too wet and too dry. For the operator with plenty of power, this is not a serious problem, since the soil can not be injured by comparison in the too dry range, but can be harrowed (disced) progressively deeper—with a land roller in tandem—maintaining a crumb structure on the surface to delay further evaporation.

The greatest potential danger arises in the use of the moldboard plow, where much moisture will be dissipated if the plow is not followed by the fitting implement (disc or disc and land roller) drawn behind the plow. Often one observes the land being plowed and allowed to dry out completely before the fitting tool is applied. On the other hand, one sees land being plowed too wet, where compaction is taking place and live substance is being put under lock and key for another year and sometimes much longer.

If the moldboard plow must be used and there is a cover crop, it should first be disced into the soil and mixed therewith, to prevent the consequent "gasket" of foliage being imposed on the layer below it and thus separating it from the plow layer. When this does take place, it interferes with the upward movement of capillary moisture, and could quite likely impair the gravitational infiltration in the case of excessive subsequent rainfall.

Undisturbed soil will lose moisture slowly, especially if covered with vegetation. The plowed field will lose moisture rapidly. The plowed and fitted field will lose moisture more slowly than the field that has been plowed only. A field properly fitted after moldboard plowing should be able to entrap and infiltrate subsequent rainfall with a fair degree of success.

The tiller of the soil only scratches the immediate surface, to destroy the plants existing there and incorporate them with the soil, to make a bed for the plant to be grown. Consider this then as a mulch. This mulching is about all that can be accomplished with existing tillage tools. The seed bed, so called, is only needed for a period of a few weeks at the most. The writer does not believe that cultivation is needed thereafter, except to keep the weeds destroyed until the plants gain the supremacy. Some of the best yields yet produced were the result of mulching or keeping the noxious weeds shaved from the surface without disturbing the earth and destroying the feeder laterals of the crop roots. In the case of plants like field corn, there must of course be intensive cultivation when the plants are young, to keep certain weeds down. When these are destroyed, there should be no need to continue late cultivation. The health of soil and plants will then best be served by planting down the intertilled crop with some plant or combination of plants that will protect the surface from the direct rays of the sun, control erosion by holding the soil in place, take the impact of violent showers and be well entrenched when the

grain is harvested. The vigorously growing winter plants work best for this purpose.

Contrary to popular belief, these grasses, small grains, legumes and other appropriate plants do not seriously compete with the intertilled crop but are a vast aid to its healthy maturity. While it is generally true that the top six inches of the soil are the best, it is also true that were it not for the underneath, there would be no food grown worth mentioning. So look at the top six inches as a mulch for the natural storehouse below. The writer believes that this protection and control can best be accomplished by keeping the surface continually clothed in a verdant cloak.

In appraising soils, one should first consider their foundation, manner of formation, parent formation, method of accretion, and such other influences as are pertinent to the region. The great body of the land surface of the earth consists of residual soils or soils of degradation, the result of the weathering of rocks, and found either in place or transported from their original location. The most productive soils are usually those of the river valleys, alluvial soils or soils of aggradation.

A mistaken idea that finds some popular belief is, that naturally wet lands hold moisture better than those that have either topographic or good interior drainage facilities. The reverse of this is true, and facts can be observed on every hand. The growths on such lands do not survive long dry spells. This is because if there is a high water table, plant roots must of necessity have shallow penetration. They cannot enter the water table and can only extend to the capillary fringe. Where there are no plant roots, there can be no humus from decaying vegetation . Aeration is stalled; water, in descending through the strata, draws in air which again escapes upward when the mass is refilled.

While a great mass of water descends annually on the lands in the temperate zone, only a part stays in place. The greater share, especially in violent rain storms, runs off the surface and carries with it soil and fertility. Changes in temperature and moisture throughout the seasons (especially Spring) do much to prepare earth particles for migration. But only wind, water and the force of gravity carry out the actual displacement. So long as there is land above sea level there will be a loss of earth particles to the lower levels. The thoughtful land owner will do everything in his power to insure himself against this migration of his own soil and have his foliage traps set for that which descends upon his acres.

In conclusion, it must be remembered that the six inch crust must be managed for the benefit of the succeeding earth layers. Then this upper crust acts as a filter to the natural storehouse below, which will in turn pay out to the upper crust when the need arises. The moral to be drawn from the foregoing is, to manage the land to hold the moisture. If the rainwater can be caught up by the earth, the soil will not wash away.

Grape Pomace

The left-overs from wineries, contain beside a varied bacterial flora, a certain amount of nitrogen, usually about 1 per cent. Smaller amounts of phosphorus and potassium are also present. Such material should be treated like other green matter in the composting process. The seeds of grapes contain valuable stored elements that will break down without much trouble through the action of fungi which like the tannic acid in grape seeds.

A Rotation Plan For The Poultry Range

By THOMAS E. JOHNSTON

MANY small poultry keepers consider their chicken yard and family vegetable garden as belonging to separate worlds, divided by an impassable fence, At least, they hope the fence proves impassable to chickens which might scratch out pea seeds or corn grains from newly-planted ground or peck holes into ripenening tomatoes.

No doubt it is desirable to keep chickens away from the garden when it is producing vegetables. However, to continue raising vegetables for an indefinite period of years on the same ground violates a basic principle of organic husbandry, crop rotation. To range chickens on the same ground more than a few years violates the same principle.

These violations bring punishments upon the farmer. He must apply more know-how and harder work year by year to his overworked garden in order to maintain yields from it. His battle against insects and plant diseases becomes more strenuous. Chickens on non-rotated ranges become disease-ridden and unwilling hosts to internal parasites. A few hundred round worms in the chicken's intestine cause the host to turn pale, look upon the world with jaundiced eye and eventually lose interest in life entirely.

By combining vegetable gardens and chicken ranges in a rotation we can by-pass many of the ills to which each alone will fall prey.

R. Y. Bailey and W. N. Nixon, agronomists with the Soil Conservation Service, writing in the United States Department of Agriculture yearbook of 1948, describe the ideal rotation as "one that achieves complete harmony between the farmer's demand for cultivated crops and the needs of the land for protection."

A three-year rotation plan including truck crops, winter grains, grasses and legumes, the latter to be used as poultry range, will go far toward harmonizing the needs of all these crops and bring benefit to crops, chickens, and soil. In this article I am presenting a rotation plan on a small scale for several reasons:

(1) Like principles apply to rotations whether the area in question encompasses five acres or five thousand.

(2) As an example, five acres may be more clearly understood than five thousand.

(3) Vastly greater numbers of people keep chickens in family-sized flocks of 100 to 150 hens than in large commercial flocks.

A good slice of all poultry and egg production in the United States comes

from moderate-flocks, operated as a sideline to general farming. While the fields and pastures of the farm may be carefully rotated and well cared for, the chickens in these sideline flocks often run year after year on some negelected lot. Also during recent years there has been a considerable landward movement of erstwhile city people who become part-time farmers and usually small poultry growers. The success of small growers depends upon sound management as directly as does success of large operators.

I recently visited a farm containing five acres of cleared land and a ten-acre mixed woodlot operated by Mr. and Mrs. Stevens and their three children. Mr. Stevens is employed five days a week away from the farm. Thru the REA they have recently installed electricity in their house and buildings, which will soon be used to furnish power for a pressure water system, serving all buildings.

"Perhaps with running water in the chicken house, you will keep more chickens," I suggested to him.

"No, with the land I have I won't keep over 200 laying hens, maybe 150," he said. He explained that at first he had kept more than that number. In his early inexperience he did not fully realize how urgently chickens need fresh ground for pasture and range. The first two years chickens thrived well, because no chickens had been kept there before the Stevens had built their home in this location. Encouraged by this start, Mr. Stevens made the almost fatal mistake of expanding his operation to seven hundred layers and raising all young stock required on a small plot of ground.

Troubles fell fast that third year when pullets began to "go light", get sick and become paralyzed. Luckily for him, he was able to get out that year and start again the following year with a new range. Since then he has rotated ranges on a three-year cycle. The valuable lesson he has learned from this experience is to limit the number of chickens to the amount of clean range he has available for growing stock.

Now let's follow a three-year rotation from truck patch, thru poultry range, and back to truck patch and try to anticipate how it should work. In the fall after vegetables have been harvested there is still time to sow winter grain. The ground need not be plowed, but can best be prepared by discing or harrowing. Along with this winter grain we will sow grass seed. In the northeast section of the United States our winter grain may be wheat or rye, and the grass sown with it may be timothy, orchard grass, Kentucky blue grass, perennial rye grass or others. It will probably be a combination of two or more grasses.

The Pennsylvania State College recommends for poultry range the following combination of grasses and legumes: six pounds Kentucky blue grass, ten pounds perennial rye grass, four pounds Canada blue grass, two pounds red top, two pounds ladino clover, one pound white clover. Amounts given are for an acre of ground.

The grasses should be sown with grain in the fall of the year and clovers broadcast over the area the following spring without working or cultivating the ground. By sowing these seeds we will have laid the foundation for the chicken range which is to follow.

During the first spring and summer after this mixture of grain, grasses, and legumes has been sown, the wheat or rye, being an annual plant, will make its maturing growth, while the slower starting, longer lived grasses and legumes are becoming established. The general farmer, following his rotation, harvests the grain at this time as a cash or feed crop and uses their straw for bedding animals. It will probably not be profitable to harvest grain from a small area, but many uses may be found for it. The small or large scale organic farmer will find in early-cut grain an excellent material to form the basis

of a compost heap. Chicken manure, soil, and ground limestone layered into this material are just what the doctor ordered for making highest quality compost.

After the grain has been cut and removed, grasses and legumes will come into their proper estate and cover the area with sod. By midsummer, with favorable weather, it will furnish grazing for the family cow, sheep, or goats; or a crop of hay may be cut from it.

By the second spring after it has been planted this area should furnish excellent poultry forage and provide a healthful environment for chickens of any age, especially young pullets growing up to be layers of the following year. I plan to discuss methods of keeping this range in top condition thru the grazing season in a later article of this series. Frequent mowing and moving of the chicken shelters are essential steps in keeping the range top-notch.

"Grass and legumes in rotation improve the structure of the soil by making it more granular and thus increasing its ability to absorb water. Residues from grasses and legumes that are returned to the soil as green manure increase organic matter and nitrogen in the soil," write Dr. Bailey and Dr. Nixon in "Rotations for Problem Fields", quoted previously in this article from the Yearbook of Agriculture.

The spring after its use as a poultry range we will plow and prepare this plot for use as a vegetable or truck patch. At this plowing its soil structure, tilth and fertility will be improved still further by the addition of freshly-prepared composts. The lime requirement of the soil should also be met to insure good growth of vegetables and grasses and legumes to be sown in that fall and the next spring.

Adaptations of a three-year rotation are many, allowing the person employing this general method to use many variations in serving his own best interests within the range of climate and soil locality. Specific grains and grasses mentioned in this article represent but a few of those which have been successfully used.

The University of Maryland recommends a mixture of grasses and legumes for poultry range including eight pounds Kentucky blue grass, eight pounds timothy, three pounds of alsike clover and two pounds of ladino clover. Alfalfa has not been widely recommended as a legume for chicken ranges in recent years because of its tendency to make a matted growth and promote unsanitary conditions on the range.

A properly conceived rotation aims to keep a farm at its highest level of productive use while improving soil tilth and fertility. General features of good rotations which lead toward this objective may be summarized as follows:

(1) Soil should have a protective covering of vegetation, especially in winter.

(2) Rotation should include a mixed sod and livestock grazing.

(3) Plowing and use in cultivated crops should be held to a minimum, as cultivation damages soil structure.

In the suggested rotation presented in this article, it is planned to have a cover crop each winter: the first winter after vegetables annual grain will furnish the cover and sod in subsequent winters. Poultry ranging on mixed sod will add the benefit of their droppings to that of the mixed sod. This field need be plowed but once during the complete rotation, that plowing in preparation for its use as a vegetable patch, its only year under cultivation.

Memos To Farmers

Boll Weevils Getting Worse; Other Signs of Trouble

Boll weevils gave Dixie's cotton farmers more trouble this year than in many years. Southern Alabama, southern Georgia and the eastern Carolinas reported heavy damage. However, the U. S. will still have a surplus of cotton despite a 10 per cent loss to the weevils. Before the advent of chemical fertilizers the boll weevil was unknown.

Farmers in this chemiculture era are having more and more trouble with insects. Insects, by evolutionary processes, are developing strains that are not harmed by even the most powerful insecticides. Experiments with accelerated heredity of the common housefly have turned up some insects, after fifty generations, that are immune to DDT.

Other signs of agricultural trouble have also crossed my desk recently. I quote an item sent out by the North Carolina State college.

"Until recently, potato diseases were of only minor importance to Alaskan farmers. Now, however, some of the diseases have become so severe that many farmers have decided to discontinue potato growing."

Keeping Up Soil Organic Matter

The University of Missouri College of Agriculture has recently completed experiments on the value of keeping up soil organic matter. Experiment Station Circular 336 by M. F. Miller, explaining the results of the experiments, is now available.

The Announcement of publication says of the experiment, "the great importance of organic matter in the soil is not appreciated by most people. Actually a good supply of this important material is the very foundation of soil productivity. This circular tells the story of a study in maintaining, or increasing, the amount of soil organic matter and nitrogen. The study was carried on at the Missouri Experiment Station over a period of 24 years.

"There is no doubt," says the author, "that the means of supplying an abundance of organic matter and nitrogen to the soil are within reach of every good farmer."

Sanitation Is Best Parasite Prevention

No drug can undo damage already done by worms or other parasites. The best way to prevent parasite infestations is to keep your livestock free of them in the first place.

Here are four steps to help prevent parasites recommended by the Illinois College of Veterinary Medicine.

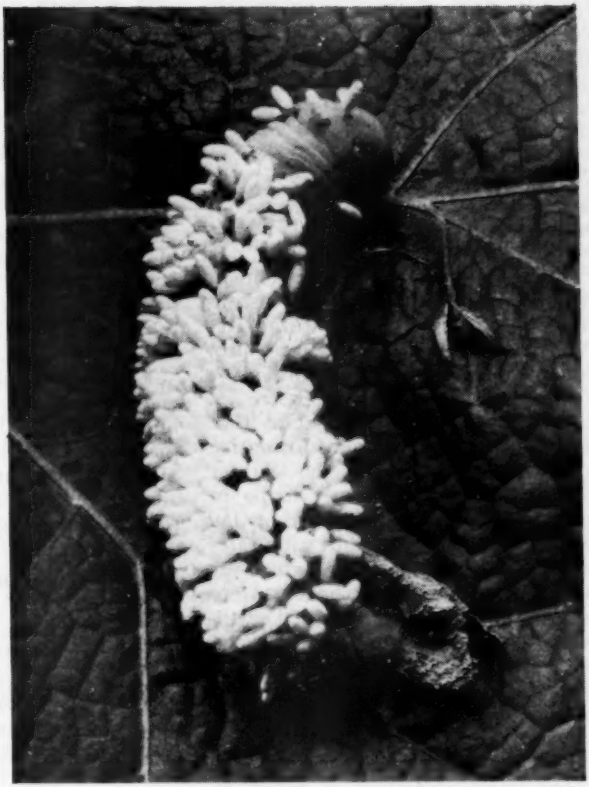
1. Rotate pastures frequently, and don't overstock them. Keep your animals out of poorly drained pastures.

2. Provide clean quarters or clean pastures for the birth of young animals.

3. Feed an adequate ration with a proper balance between proteins, carbohydrates, vitamins and minerals. Provide plenty of clean, fresh water.

4. Prevent contamination of the feed with manure. Manure usually contains parasites.

A Natural Insecticide At Work



Poisonous insecticides are not needed to destroy insect pests. This doomed tomato worm is being killed by wasp larvae acting as natural insecticides.

The female of this specie of wasp lays her eggs in the body of a tomato worm. She "stings" him many times, depositing an egg with each thrust. When the eggs "hatch" the larvae emerge from the skin of the worm and begin to feed on his body. By the time they have matured they have robbed the worm of his body fluids and he dies.

Devaluation Won't Slash Farm Prices

The devaluation of the English pound and 25 other currencies will not reduce farm prices as much as some people had feared. Although it will now be more advantageous for many countries to export to the U. S., our domestic production is so high that we will be able to undersell most foreign producers.

Wool is the most important product imported from the devaluating countries and U. S. wool producers will probably feel a slight pinch.

Decreased exports of farm products from this country will force prices down somewhat, however. But the Marshal Plan funds will not be affected by devaluation and will enable European countries to continue buying from us. Shipments of American farm products to Europe have already been cut to the minimum and are not likely to be reduced further. However, devaluation will probably place increased burdens on the government price support program.

Fresh Paint a Danger To Livestock and Children

The American Veterinary Medical Association warns that cows and children have an unexplainable craving for the taste of fresh paint.

If cows are allowed to come in con-

tact with freshly painted surfaces they will lick them and come down with poisoning. Children often chew painted furniture or other objects. The Association advises farmers to use non-lead containing paint for interiors of cow barns and stables.

Earthworms Prevent Frost Damage to Soil

An account of an experiment in the May issue of the recently discontinued Journal of Agricultural Research emphasizes the need for a protective cover crop over the winter.

The experimenters, Clarence S. Slater and Henry Hopp, state that "soil that had some form of insulative protection throughout the winter months was found recently to be in better condition than soil that lay bare over the winter. Infiltration rates and water-stability were higher for the protected soil. These benefits were associated in part with increased earthworm activity. On the unprotected soil, there was evidence that the structure had deteriorated during the winter months. The deterioration appeared to be related to the action of frost on the unprotected soil.

"Insulative protection of mulch or vegetation reduces the number of times a soil freezes, and the depth to which the frost penetrates. It promotes and retains large populations of earthworms. These increase soil infiltration, thereby allowing the drainage of excess water out of the surface soil. By favoring the activity of earthworms the hazard of freezing at high moisture contents is reduced."

Canadian Timber Gone In 60 Years

There will be no marketable timber left in Canada within 60 years, say the top men in the Canadian Forestry Association. However, growth of Canada's 27.8 million acres of accessible forest can supply all the Dominion's needs if young stands are left to mature and if other conservation measures are taken. Three times the present amount of reinvestment in forest replenishment is needed to prevent exhaustion of Canada's timber resources.

New Scale Will Weigh Livestock More Accurately

Officials of the U. S. Department of Agriculture announce that they have a speedier, more accurate cattle scale that simply can't make the mistakes complained of in weighing livestock on the old kind of scales.

The new scale measures weight electrically. When you press certain buttons, this device automatically prints the weight, number and type of animals, the names of the weigher and selling agency and the date and time of weighing.

Information Wanted

If you are running a profitable farm by the Organic Method, The Organic Farmer wants to know about it. Write us giving your acreage, the number of years you have been farming organically, and other pertinent information. Manuscripts and photographs describing the operation of organic farms will be considered for publication. Readers are also requested to send in pictures and/or descriptions of time saving home made devices and original techniques.

Tramp Your Silage Surfaces

"Tramping any silage topfill left unprotected by some covering brings up the level of good silage," says Charles F. Rogers of the Department of Agronomy at the Ohio Agricultural Experiment Station. Any method of treatment that keeps out air helps to keep the silage good.

Tramping is the original way and for many farmers the most satisfactory way to increase the yield of good silage

from a filling, continues Rogers. It is best, of course, to do most of the tramping after filling ceases. While silage is settling most rapidly the surface needs more attention. The tramping works the silage to the wall and keeps the crack at the silo wall closed.

For the first three or four days, tramping morning and night for 15 minutes will be best. When there seems to be no more give to the surface, work on it is completed for a time that increases as the topfill becomes firm.

When careful and vigorous tramping does not bring the silage surface down along the walls more than an inch, a 2-day interval for tramping will be good. After two weeks, once in 3 or 4 days is good until there is no tendency at all to open a crack along the wall. This kind of treatment also reduces spoilage at doors that may not be perfectly tight.

Exact numbers of trampings or length of each cannot be told, because the nature and condition of each silofill will be different in age, drymatter content, and the manner of filling and distribution.

The purpose of the careful treading of the whole surface and extra walking at the walls is to keep the top surface pressed down as much as possible to make an air-seal of the warm moist layer just above good silage in the silos not protected by mechanical moisture-air barriers.

—Robert Rodale.

Oyster Shells

While the main value of oyster shell flour is generally considered to consist of the lime and trace minerals, it was found according to Misc. Publication 136, U. S. D. of Agriculture, that siftings from oyster shell mounds contained also .36 per cent nitrogen and 10.38 per cent phosphoric acid. This surprisingly high phosphorus content would warrant the use of such material in preference to lime whenever it is obtainable.

Heuser and Norris of Cornell University published in *Poultry Science* 25 (1946) 173 an article on various grits, oyster shell, ground limestone etc. and their effect on poultry growth:

"The results of an experiment in which oyster-shells, calcite grit, and ground limestone were compared as sources of calcium supplementary to that present in a representative commercial laying ration, the mash of which contained approximately 1 percent each of calcium and phosphorus fed as supplements to the laying ration with crushed oystershell and calcite grit gave better results as supplements to the laying ration than ground limestone, especially during the latter part of the year. There was no difference in egg production between hens getting crushed oystershell or calcite grit. Egg production was significantly lower on ground limestone than for the birds receiving crushed oystershell or calcite grit. Body weight was better maintained in hens receiving crushed oystershell than in those receiving calcite grit or ground limestone. The birds receiving ground limestone showed higher mortality than the other groups. Eggshell strength rated in the order of oystershells, calcite grit, and ground limestone. Additional feeding of granite grit had a favorable effect on egg production and the pounds of feed required to produce a dozen eggs when fed with crushed oystershells or ground limestone. Calcite grit also had a favorable effect in this respect. Additional feeding of granite grit seemed to have no influence on body weight or mortality but a favorable influence on eggshell strength.

NON-ACCEPTABLE MATERIALS AND PRACTICES

S. C. S.

Burning Fields

The burning of weeds, grass or trash is a destructive practice and should always be avoided. Earthworms, bacteria, fungi, protozoa, algae and other soil organisms are killed. Soil organic matter in the upper few inches is consumed. Moisture is dried out of the soil and the water table is lowered. The tilth of the soil is harmed because soil particles are broken down. There is always the danger of the fire spreading to nearby buildings, fields or forests.

Coal Ashes

Coal ashes, hard or soft, should never be used, either on the farm or in the garden. They contain dangerous, soluble compounds containing sulphur which has been shown to be an important factor in causing cancer. Above a small amount, it is toxic. Some soft coals contain too much iron, which also becomes toxic. Soft coal ashes have as much as 10% sulphur trioxide and when water comes in contact with it, it turns to sulphuric acid. A reader recently wrote us:

"Several years ago a portion of our garden was ruined by coal dust. A coal pile stood at the top of the bank and water washed it down on the garden. Anything I plant there, such as onions grow about three inches and turn brown at the tops. The part nearest the bank doesn't grow anything."

Creosote

Do not use creosote to preserve wood in seedling flats or wood for compost bins. It is highly poisonous. Use linseed oil or other organic material. Cuprinol, a wood preservative that kills fungus, may also be harmful to soil. We do not recommend its use.

Gypsum

We do not recommend this product because of its high content of sulphur and the connection between sulphur as a possible cause of cancer in human beings. In dry western irrigated lands which are dangerously alkaline, and suffer from alkali disease, gypsum and other sulphur products are used to reduce the pH, that is to make it less alkaline or even acid. It has been found that this can be more safely accomplished by getting a lot of organic matter into the soil. Where composts are made for such alkali soils, no lime should be used. An attempt should be made to keep the compost acid.

Lake Water

A reader seems to be bothered with coontails and other weeds on his lake and wishes to remove them with blue vitriol, a poison. Do not do so. Rather remove the coontails and other weeds and use them as organic matter for your farm or garden.

Lime

Use only ground raw limestone and not the hydrated product which is called builder's lime. Also stay away from quick lime. The latter two are strong and will kill bacteria and even earthworms.

Lye

Lye, which is crude soduim hydroxide, should not be used in the compost heap to speed decay. It will kill soil organisms. The lye is so strong that it can dissolve an iron pail. If put with garbage it would dissolve all the tin cans, but the resulting product would not be good biologically.

Moth Balls

We do not recommend the use of moth balls in vegetable gardens to repel insects because we feel that the chemicals in these moth balls may affect the vegetables. The rains will wash some of it into the soil. Recently a child became severely ill from the daily practice of sucking moth balls. It is a poison.

Newspaper

A little paper in compost would not be harmful, but excess quantities should be avoided. Sodium sulphite and other chemicals are used in manufacturing paper. Inks also contain substances which are toxic to soil organisms.

Pelleted Seeds

Seeds are sometimes pelleted with chemical fertilizers. They should not be used. Nature stores enough food in the seedling to last it for the first week or two. Organic matter and minerals are needed for the roots and not too close to the seed.

Salt

Do not ever use salt in the farm or garden. Sometimes salt is advised for asparagus. We have found that placing rocks with asparagus is much better. When the ocean inundates land, it spoils it for cropping for many years. Use organic matter.

Soil Fumigation

Do not use soil fumigants designed to kill larvae of various pests. Fumigation kills valuable soil bacteria.

Soilless Culture—Hydroponics

Leave hydroponics severely alone. In the first place it is quite expensive. Secondly, it is the most chemicalized method there is. Plants cannot absorb the necessary minerals in the proper balance from chemical solutions and are bound to be unbalanced nutritionally. The food so produced may look normal and healthy but no doubt would contain less vitamins. If all our food were raised in this manner disease might increase to such an extent that even the human race would have difficulty in reproducing itself. It is the humus in the soil which sees to it that plants take the different minerals in the right amounts to grow a healthy plant.

In the South Pacific during the war, when soilless culture was practiced, they had trouble with certain crops. Someday a water culture, organic method might be worked out, but it would be more expensive than growing things in good old soil.

Soot

Under no circumstances do we recommend the use of chimney soot. This is highly charged with sulphur and is much too strong for use as a fertilizer. The fertilizer experts are universally agreed that the nitrogen percentage of chimney soot is very low, usually less than half of one per cent. Its carbon content is valuable, but the quantities of ammonia and sulphur oxides also present make soot actually equivalent to ammonium sulphate, which we have always rejected. If your soot comes from wood fires, it would be a different matter, it might then be used with advantage. There has been much evidence uncovered indicating a relationship between the use of sulphur and cancer in human beings.

Sterilizing Soil

We do not recommend this practice, even in greenhouse soil. The live steam used kills beneficial as well as injurious organisms. We also do not advise baking soils that are to be used in seed flats. Stick to natural methods.

Tobacco Stems and Dust

Some people like to use tobacco dust as an insect deterrent because they think it is an organic product and, therefore, not harmful, but if it is strong enough to kill disease organisms, it is also strong enough to destroy beneficial organisms. We do not recommend its use but suggest that if your soil is constantly enriched with organic matter, conditions will be set up which will redute disease to the point where insects are no longer a problem.

One of our readers who used tobacco dust in the soil when planting young peach trees saw them die. Apparently the nicotine or other poisonous compounds which leached out of the tobacco dust came in contact with the roots and killed them.

Water

If possible do not use chlorinated city water on soil or in compost heaps because it will kill bacteria. Rain and pond water are best. Well water is also satisfactory.

Wheat Storage Sprays

We never have to spray our wheat in the barn on the Organic Experimental Farm. If grown by the organic method it stores much better than wheat grown with chemical fertilizers. We do not treat our seeds with poisons to kill the smut and rust organisms. We have far less disease infestation than the average farmer.

—J. I. Rodale.

Organic Farm Power

By ARCHER P. WHALLON

IT may be that before many years it will be the ordinary thing for the farmer to heat and light his buildings, and drive his car and tractor with gas power derived from his manure pile and compost heap, and many a town and village will solve its garbage disposal problem in a like advantageous way. That is the potential implication of a revolutionary development now taking place in France and Germany—the production and use of methane gas derived from organic wastes. It seems an astonishing oversight that practically nothing has been published in the English language about an agricultural innovation of such vast possibilities—one that may enlarge the field of organic agriculture almost beyond imagination. However, some literature is available in French and German. In the January 1949 issue of the well known French magazine, "Vie a la Campagne", is a leading article, "Un Gisement de Carburant dans Votre Ferne", which gives a fairly complete description of "le gaz de fumier." Also, in the Sunday edition of the New York City German language paper, "Staats-Zeitung und Herold", for March 6, 1949, that paper's correspondent in Hamburg gives an account of an organic methane gas plant in western Germany. The present article is based on, and consists mainly, but not exclusively, of translations of extracts from these works. Anyone who desires further information should read them in the original, some of which is rather too technical for one with but little knowledge of chemistry.

Methane, CH_4., (the English spelling often menthane, or menthan) also called metagas or zymogas, is known, in the impure state, as marsh gas or firedamp. It is present in stagnant pools and swamps where organic matter is allowed to decay in a limited supply of air, as often under water. It is a colorless, inodorous gas with a density of 0.559 (Air=1.) It burns with a faintly luminous flame and very hot heat. Mixed with air or oxygen in certain porportions and then ignited it explodes violently, one volume of methane forming with 9.5 volumes of air an extremely explosive mixture. As the firedamp of coal mines, methane has been the cause of catastrophic explosions.

Probably the existence and distribution of methane gas is greater than known, for its presence would not be recognized unless ignited, and under natural conditions, it would be quickly diffused and disappear in the air. However, it occasionally becomes ignited over swamps and marshes, sometimes arousing the fears of the superstitious. Possibly the best known of these occurrences is that of the "Holy Fire" of Baku, in the neighborhood of the Caspian Sea. I recall also that some forty years ago, people in my home community in southern Michigan became much concerned over some mysterious fires over and

on the banks of some swamp ditches and ponds, which were finally identified as "marsh gas" flames.

Methane gas has been known from antiquity, and according to the writer in, "Vie a la Campagne", as far back as 1776 it was studied by Volta, the Italian scientist, from whose name stems the electrical term "volt". There have been made, at various times, suggestions for the practical use of methane gas, as in 1884, when there was a plan for the use of the manure from the stables of the horses then used to pull the Paris omnibusses. But this was abandoned because of technical difficulties then seemingly beyond solution, and further experiments were retarded by the following abundance of gasoline.

The former mechanical difficulties are now practically overcome, and the current apparatus for methane gas manufacture is described as simple, and of a robust construction, resulting in a rapid amortisation of the initial cost. The equipment described and pictured as used in France, is relatively simple and not above prohibitive cost for the average farm. It is composed essentially of 2 or 3 concrete tanks of an average capacity of 10 cubic meters. Two tanks at least are necessary to assure continuous production. Other material than cement may be used for the tanks, if desired. The tanks may be either above or below the ground level. The latter is advisable in colder climates and high altitude regions, and wherever there is a marked difference between day and night temperatures, as the interior temperature of the tanks should be held as uniform as possible to assure an uninterrupted bacterial action.

The tanks have a sheet metal cover which is fitted with an examination pipe (un bec d'essai). The covers rest on a hydraulic closure that assures an hermetic seal, and forces the gas into the distribution system, or into a storage gasometer. The use of a gasometer assures a more regular supply of gas to appliances, and an attached purification apparatus results in a better quality gas. The 1948 cost of the equipment in France was, 70,000 francs for one 10 cubic meter tank, 120,000 francs for two tanks, and 70,000 francs for a suitable gasometer —to which must be added the distribution pipe and fittings required.

The method of filling and of management of the tanks is relatively simple and is little more laborious or difficult than the making of a hotbed or compost pile. It is recommended that a starter or inoculation base from a previous tank be used if possible. Cover the bottom of the tank from 8 to 10 centimeters thick with a foundation of old manure taken from a preceding tank. Then proceed with filling the tank with manure not less than 5 days nor more than 3 months old, well broken up and mixed in a homogeneous mass. Pack firmly and allow the mass to ferment in "heat" in the open air, the tank being uncovered, for 5 days. After this delay, cover with a liquid manure (purin) mixture so that the level of the liquid is 15 cm. above the level of the manure. The liquid from a previous tank is recommended, as it releases an inoculation favorable to methanic fermentation. The manure used should contain a large proportion of undigested vegetable matter, and other vegetable wastes to be used. From a first fermentation, the gas becomes combustible between the fifth and the fifteenth days, according to the nature of the material and the temperature during the process. From following fermentations, the gas is obtained in 48 hours. On the average each tank furnishes 3 to 7 cubic meters of gas per day during 3 months.

Methane gas is not dangerously explosive at normal temperatures. The slight odor is inoffensive, but sufficient to indicate its presence in case of leaks in the system, and the gas is not toxic as in gas from coal. Methane gas burns very well in stoves and appliances suitable for burning butane (our familiar tank gas) which require but slight modification. It

also furnishes an excellent fuel for stationary gas engines, and when confined in tanks, for cars, trucks, and tractors. Its use is suggested for colonial or frontier regions where oil fuel is expensive or difficult to obtain.

This French writer continues—"Its possibilities of national production are enormous. It could have in France an annual production about equal to that of the gasoline used.

"The manufacture of gas from stable manure and organic wastes recovers an energy now nearly a total loss, and it is also the more interesting, *because it destroys nothing of the manure, except fortunately, the larvae of flies. On the contrary, it increases the fertilizer value by fixing the ammonial contnt.* There is no loss due to drying by the sun, nor through erosion or run-off caused by rain, and the material taken from the gas tanks is in better physical condition for spreading on the land."

The accuracy of this statement that there is no injury to fertilizer value of the organic material so handled, some may question, in view of the exclusion of air from the tanks during methanic fermentation. Air is regarded by some authorities as an essential for the development of beneficial soil bacterial action—but it should be noted, that in the process, air is not completely excluded.

The article, in German, in the "New York Staats-Zeitung", gives very much the same data, but stresses more the possibilities of village municipal methane gas plants.

"In western Germany, the first biological humus and gas works are now in operation. At the agricultural experiment station at Allerhop, near Soltau, in the Lunenburger Heide (British zone), for 8 weeks a daily production of 10 cubic meters of highly valuable methogas have been produced from potato waste, rushes, weeds, and stable manure. Two kitchens of the station cook regularly by the blue, odorless, gas flames that have their origin in a slime reservoir (Schlammbehalter) located 50 meters distant.

The combined capacity of this first biological humus and gas works (Bihugas Anlage) amounts to 40 cubic meters of gas per day. Of this production, about 10 cubic meters will be diverted to cooking and heating, and the remaining 30 cubic meters will be delivered in gas flasks for tractor fuel. This Bihugas plant, will, besides cooking and heating gas, also produce per day 20 liters (monthly 600 liters) plant-forcing fertilizer, for which no coal is required, but only the manure from 10 cows and about the same amount of organic waste material.

The experimental plant at Allerhop was developed by the combined experimental work of Ferdinand Schmidt, of Verden, and Professor Popel, of Stuttgart, who have proved the system so well in practice, that it now seems only a question of time, until large individual residences and village communities can erect their own gas works. In this way, many farm women will be able to cook with gas, farmers will drive their tractors on home-produced fuel, and a better compost will be provided for German farms.

The development of the methane gas plant may be revolutionary in bringing organic farming into its rightful place—with a methane plant as a familiar adjunct to dairy barns and livestock feeding establishments. Also, as the process does not necessarily call for animal manure, the methane gas plant has possibilities as a profitable disposal measure for garbage and cannery wastes, that as now handled, are often a stream pollution and health menace.

It should be noted, that unlike that other European motor fuel, charcoal or wood gas, which in this land of abundant gasoline, never attained any considerable use, methane gas is a superior and not an inferior product, and that it does not call for the destruction of timber or any other natural resource.

Livestock

NATURAL METHODS

With Horses, Cows and Sheep

By W. A. RILEY

Reprinted from *The Farmer*, England

DURING the war years we rediscovered nature and by forethought and study we arranged a system of complete natural feeding and management compatible with civilised methods. We began this study with our dogs, Greyhounds and Dachshunds, and it seemed wise to extend this to include our farm animals.

With dogs the different breeds have different hereditary weaknesses and from these weaknesses inherit conformation weaknesses. Diseases or toxic conditions will attack these vulnerable spots. Our aim is to breed stock possessing hereditary soundness and then to rear them in such a way as to eliminate all chances of revertion to former deficiences.

Dairy cattle, which have been subjected to unnaturally large lactations over several generations have mostly diseases of udder and organs of reproduction. Horses, which have suffered generations of leg and lung strain are subject to bone and muscle disorders and ailments of respiration.

In order to keep our stock healthy we must first study the natural wild conditions of the same species, secondly, we must feed only unrefined, whole foods, and, thirdly, we must eliminate artificiality in management (the closed top door, the intensive housing system, the use of rugs), and above all we must keep the land in a natural state by complete freedom from artificials, dressings, sprays and pest destroyers—all of which must be strictly banned; the whole life of the farm is then prolonged indefinitely and forever.

Horses.

The only purpose of stabling is to maintain a sleek coat condition. We have kept thoroughbreds out day and night even during the dirty war winters and they never have had a cold and their joints have remained supple. If the bugbear of "week-ends" could forever be abolished the disastrous effects of stabling would not be so manifest. We can equally never hope to achieve healthy agriculture while animals are rushed and neglected from one o'clock on Saturday until Monday morning; nature is balanced and this is not. The amount of week-end work may be reduced if we realise that the stuffing of animals with food is both unnatural and harmful and that a day of light feeding is highly beneficial to the digestive system, the stomach and the health. We arrange for Sunday to be the day of light rations. A feed is given in the mornings only.

Hay is a natural winter food. Given hay and exercise the horse will be well, but skimp one and the whole body is at once unnaturally managed.

A horse on a small oat allowance but with three hours' daily exercise balanced with brisk walking and faster extended work, with abundant sweet hay and lying out at grass is kept fitter for saddle and harness work than another cooped, stabled, washed and cosseted.

Cold water bandages of cotton wool covered by dry flannel bandages are the ideal remedy for severe strain and work; nothing else is necessary. We believe in exercise the day after heavy work or hard riding as this stimulates stiff muscles and promotes circulation and breathing. Carrots are useful but roots are not readily eaten; the horse has a small stomach. It is important to keep the horse off food and to prevent large intake of water before fast work. We use only rain water. Tap water is full of chlorine. Natural water never harms a healthy interior and animals are wonderful selectors of good and bad when their palates have not already been ruined by artificial selection.

Clothing we have always condemned. We have actually clipped horses with ragged coats and kept them out and their health has been perfect. We equally condemn all proprietary foods, potatoes and chaff and we give no medicines. We feed good hay from natural pasture, untreated in any form, save with muck or compost.

Cattle.

The cow has a large, capacious stomach and she likes bulk; we, therefore, feed primarily hay. I am referring entirely to winter feeding as on our methods summer feeding is of grasses alone; this has never caused scouring or blowing because the digestive system is in full working order and our pastures were sown with herb strips so that in all cases the natural remedies are close at hand. We add some crushed oats; these are fed whole to horses as they are more valuable, but the cow passes whole oats through her. Whole grains are primarily bird food, easily digested and utilised by birds. We have used roots in abundance and sugar beet tops. Dried sugar beet pulp we feed unsoaked as this, being like mild cooking, destroys its value. Kale and all green vegetables are important. I am not personally fond of potatoes but if fed, they should of course be fed whole.

For convenience the cows sleep in at night and their body heat is conserved thereby adding to yields of milk, but top doors are wide and daily exercise is strictly maintained even in deep snow.

Plenty of stream water is available throughout the day but no water is given in the shippons as water on top of dry food is a mistake. In its wild state an animal sleeps on a full stomach and has to move to reach water. It does not turn on a tap purely from boredom. We have had no barrenness, no mastitis and no abortion, no Johne's disease, no difficult calvings, but previously these things had occurred on our farm so it was not a question of the farm's immunity.

The high yielding cows have in addition either bean meal, groundnut or linseed. We prefer a three or four gallon cow which consistently milks on for seven or eight lactations with a minimum of food rather than the grossly over-fed six to eight gallon cow which collapses after a few lactations. The latter is always having to be replaced, either by breeding or buying and both are costly and demand time. I will not deny that we have had very high yielders who have also lasted but they are the exception rather than the rule. We were gratified to find our cows were invariably mistaken for young second or third calvers when they were quite matrons. The heavy yielding cow is a potential danger.

We milk at 5 a.m. and 5 p.m., these being the ideal times.

Sheep.

We give concentrates; the sheep are a side issue to the cows; we use hay

and roots before lambing; the lambs are smallish at birth and subscribe no difficulties and no losses. Cake fed ewes often incur heavy losses in a bad season; the food goes to the size of the lambs and the ewes suffer accordingly. Small lambs get away and grow quicker than large but weak ones.

One thing we have before us as a maxim: "Never lose your foal-fat." It is great wisdom. The young of any animal must start small and continue to grow and thrive. Once he becomes pot-middled, wormy or deficient the check will be sufficient for the true natural bloom never to recur.

We always rear future permanent stock on the dam or with calves two or three calves to a cow, dependent on season and yield. We use herbs judiciously. Garlic we find excellent for worms and disorders. For all fevers and immediately prior to parturition we fast the animal. Afterbirth is allowed to be eaten but no other food given immediately following parturition. This is easily understood when we remember in the wild state the mother is not able to go and gorge immediately after giving birth to her young; her cleansings are sufficient food for her and when she is toxin-free internally, these cleansings are pure.

We study the wild grasses and ensure a correct mineral balance. We study shade of trees and the necessity for bark and twigs. Particularly are the latter needed by goats; goats are rather a study between the cow and the sheep, except that they are "choosy" feeders.

Our soil is manured, limed and grazed. In turn it is rested or ploughed with manure or compost. Silage is valuable if properly made but it is no good putting any old muck in and expecting anything but any old muck to come out.

Diseases like food are fed through the mouth.

Our foundation stock must come from naturally reared stock; nature's elimination of the weak by survival of the fittest is a golden rule. Let only the fit have a place in the farm; it is a long term policy but it is a permanent one.

Carotene Is Necessary For Good Health Of Ewes and Lambs

Mature sheep can get along for a remarkable long time on a ration lacking carotene, but a lack of carotene will soon bring widespread death to lambs. Carotene, which furnishes necessary vitamin A for all animal life, is found in green grass, green alfalfa hay, and yellow field corn.

Results of tests carried for a long time at the North Dakota Agricultural College have shown that mature ewes could exist for a year or more with an almost carotene-absent diet without fatal effect. Lambs, however, in a few weeks without vitamin A became ill, from one type of infection or another, and soon died. Also, ewes on a carotene-low diet for a long period were able to conceive but could not reproduce normally.

"These findings are especially important because in many parts of the nation there is a short growing season, sheep are pastured for much of the year on such carotene-lacking forage as dead grass and poor prairie hay," the county agent explained. "Such a diet does not seem to affect the weight of fleece of the ewes, and if a carotene-rich diet is furnished after the ewes are bred, they can reproduce and nourish their lambs normally."

Books

Farm Work Simplification

A NEW book chock full of labor saving information for the farmer has just been published by John Wiley & Sons of New York. The price of the book, $2.80, can be redeemed many times by the application of only a few ideas suggested by it.

The Authors, Lawrence M. Vaughan, Ph.D., and Lowell S. Hardin, Ph.D., make direct suggestion for work simplification and outline methods by which farmers may conduct their own time saving analyses. For example, they indicate nine ways in which the farmer may save time and effort while "doing the chores."

1. Have buildings and work areas close together to reduce travel.

2. Provide for circular travel to eliminate backtracking.

3. Use gravity to move feed and supplies—chutes, feed bins, self-feeders, etc.

4. Provide paths, alleys and doorways that are sufficiently wide, level and smooth for carts.

5. Locate tools and supplies at the place where the work is done.

6. Combine jobs and rearrange for better order.

7. Plan to complete one operation where another begins.

8. Haul maximum practical loads to reduce trips.

9. Work at reasonable speed—avoid wasting energy.

The idea of "circular travel" is also suggested for other aspects of farming. "In general, the principle of circular travel applies to machine work in the field as well as to chore work around the barn," say the authors. "Accomplishment per hour is increased by going around a field rather than back and forth because the turning time is reduced.

"Corn belt farmers frequently drill rowed soybeans around rather than back and forth across the field. Planting, cultivation and combining are thus made easier. Individual farmers are now drilling corn the same way. They report substantial (5 to 10%) fuel and labor savings due to the decreased turning and a delay time in planting, cultivating and picking. Continuous rows several miles long are made possible by rounding the corners in square or rectangular fields. After all, the man using the tractor does not need to have a row that stops at the end of each field—his team of horses does not need a rest."

"Farm Work Simplifications" contains a valuable section on simplifying handwork. Here are four suggestions made to speed up the picking of tomatoes:

1. "Use a handle on the hamper. You only have to carry a full basket by the rim with arms extended in front or to the side to realize the savings in energy made possible by the use of a handle on the hamper.

2. "Pick with both hands. When you pick with one hand and hold the basket with the other, only 83 hampers will be filled in the time in which 100 should have been filled.

3. "Pick as many tomatoes as possible in each hand before moving the hand to the hamper. First pick one tomato in each hand, then shift the tomatoes back into the palms of the hands, picking a second tomato in each hand before moving the full hands to the hamper.

4. "Pick two rows across the field and keep the hamper in front of you. Keep it within easy reach."

FARMER VICTORIOUS; MONEY, MART AND MOTHER EARTH—William J. Hale —Coward McCann, Inc. 241 pages, $3.00.

Farmer Victorious is the type of book that we would like to see more of. The author, the research consultant of the Dow Chemical Company, exhibits a competent understanding of the Organic Method and the problems that face agriculture today. He says, "Chemical fertilizers gradually contribute to a degeneration among our plants, with the result that in due time our plant geneticists are constrained to import sturdier and hardier varieties of plants from more or less primitive lands in order, by crossbreeding, to reinvigorate the seeds of our own plants."

Mr. Hale also is familiar with the damage spraying does to the soil, crops and the people who eat sprayed crops. "It is not to be overlooked," he explains, "that excessive spraying of trees and crops is all too likely to do hurt to the biological denizens of the soil. The poison sprays may so interfere with the smooth microbial life within the top few inches of the soil as to render the harvest deficient in flavor and lasting qualities."

In an excellent chapter entitled "The Soil and Health." Mr. Hale stresses the relationship of the quality of a crop to the quality of the soil the crop was grown on. He cites the example of the health of the Hunza people of India, a race that eats food grown only with natural fertilizers. He mentions the book, *The Healthy Hunzas* by J. I. Rodale, which was published by Rodale Press.

Gasoline, according to Mr. Hale and several authorities, is a cause of cancer of the lungs. He states, "Most unfortunate here (regarding cancer of the lungs) is the farmer, who, by choice of habitat, should enjoy the purest of air. The coming of the tractor has brought him no end of evil. As he rides this power machine he is forced to inhale these carcinogenic vapors from the tractor exhaust. These poisons lodge in the mucous membranes of the nose, throat and lungs, from where they are generally absorbed into the lymphatic system and more than often carried by the lymph to the neighborhood of the heart. The absorption of these poisons so alters the chemistry of the lymph cells that abnormal growth occurs and we have a condition known as lymphosarcoma, a type of cancer."

However, Mr. Hale is basically a chemurgist and he sides with the chemurgists when a controversial matter arises. The interlocking of farm and industry is the fundamental idea put forth in *Farmer Victorious*. "The day is fast approaching," Dr. Hale predicts, "when the farmer shall take command and save for the nation its unrenewable reserves through substitution of agricultural renewables. Through this good fortune, farm and factory will be made to interlock."

The interlocking of farm and factory might not harm the general fertility and condition of farm land if it was carried on in a limited and intelligent manner. However, whenever crops are raised for chemurgic purposes (to be used in industry) there is a tendency to mine the land instead of cultivating it intelligently.

When an industry exhausts its supply of a natural resource, it can depend on technology to find more effective methods of extraction or otherwise obtain new sources of supply. Although the production of the soil can be increased, there is a definite limit beyond which both the quality and quantity of harvests will decline.

Some of William Hale's theories may seem unworkable or undesirable, but, in general, his book is a fine example of the type of technological thought that will advance agriculture and industry in this country. *Farmer Victorious* is a provocative book and is of definite value to all progressive agriculturists.

West Coast Report

By T. HEE

THE Pacific West Coast is one of the most important agricultural regions in the U. S. Over its northern and central regions roam millions of head of cattle. California grows most of the nation's citrus fruits. It also leads in the commercial production of vegetable, flower, and forage plant seeds. Annually it exports millions of tons of fresh, frozen, canned, and dried fruit to other states and countries.

The Pacific Coast, because it exports the major portion of its food products to the rest of the United States, is an extremely important factor in the nourishment and health of the non-Pacific Coast population.

With the opening of vast new farm lands to be irrigated by the Great American Canal irrigation system, California is now the state with the greatest area devoted to agriculture.

The farmers of this hitherto unproductive desert land (all new "virgin" soil, not worn out by years of monoculture) would be benefited and should be fortified with the knowledge of the *Organic Farming* principles.

Although these western states are noted for the "miracles" they perform in the production of agricultural products, they also enjoy (?) a high degree of susceptibility to the prevalence of plant diseases, insect pests, and sick soils, due, no doubt, to the extensive use of chemical fertilizers, poison sprays, and mismanagement.

Because of the "quick decline" disease of citrus trees that threatens the nation's citrus supply, the Foothill Ranch, one of Southern California's largest citrus developments, is reported to have recently bulldozed out thousands of dead and dying unproductive citrus trees, in order to convert the acreage to vegetable production. It is quite possible that the same malpractice (chemical fertilizers, poison dusts and sprays) that caused the death of the trees, will be applied to the commercial production of vegetables.

A few weeks ago, California vineyards suffered extensive damage and were threatened with annihilation from hordes of green caterpillars that defoliated whole vineyards before they could be restrained by distraught farmers and County Agricultural Advisors.

In the past, valuable alfalfa plantings have been besieged by armies of destructive butterflies, caterpillars and weevils. DDT and other insecticides have been applied as controls. But who can determine the exact amounts and resultant effects of the poisonous residues that remain on and in the plants that are consumed by our dairy cows (and which must affect to some extent the health of consumers of the dairy products)?

This year, in the Antelope Valley plantings of alfalfa, (210,000 acres), blankets of aphids descended upon established fields and mowed down what would have been the first cuttings of bumper crops. *Some fields and many new plantings escaped* the ravages of these diminutive green insects that made the roadways appear as if they had been sprayed with brilliant green paint. Were these fields

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